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Welcome

If there was any indication that commercial aviation was well on the path to a full recovery, the news that came out of the 2023 Dubai Air Show in November in terms of aircraft ordered and letters of intent signed by airline CEOs showed the world that operators are expecting 2024 and beyond to be busy in terms of passenger numbers and route expansion.

But there was also a significant focus on defence this year, with Russia's invasion of Ukraine and Israel's action in Gaza very much on the mind of all those present. In 2023, many countries took a hard look at their defence capabilities, choosing to upgrade aircraft and anti-aircraft systems now rather than wait for another couple of years and potentially leave themselves vulnerable to an unforeseen threat.

With the world's media very much focused on the Middle East and Israel's fight with Hamas, Ukraine is very often not even making daily news broadcasts in the UK and US. It's perhaps fortunate that those nations supporting Ukraine have remained committed. An indication of this was the opening of the European F-16 training centre in Romania on November 13, which received very little publicity across the mainstream media. During the ceremony, at an undisclosed air base east of Bucharest, Romanian Defense Minister Angel Tîlvăr and his Dutch opposite number Kaja Ollongren affirmed: "The centre will be an international hub for the training of F-16 pilots and will facilitate increased interoperability among allies." Ukrainian President Volodymyr Zelenskyy said the training centre is "a significant practical contribution to our aviation coalition."

As Denmark, the Netherlands, Norway and Belgium prepare to donate their F-16s to help train Ukrainian pilots, the stumbling block of whose jets will go to the frontline is still a thorn in the side of the programme, with Dutch examples restricted to flying only in NATO airspace.

With a broader media focus towards the Middle East, the war in Ukraine may have a more far-reaching global impact and looks set to be the main focus of attention for all of Europe in 2024.



Glenn Sands
Editor

LEFT:

Finally, Europe has got its act together and organised F-16 training for Ukrainian pilots and groundcrews. However, with some restrictions from those participating RNLAF/Facebook

FRONT COVER:

Electro-optical turrets have become a familiar sight on helicopters tasked with fighting crime, protecting borders and SAR duties. This EC135 is equipped with a Euroflir 410 turret

Safran Electronics and Defense/Lloyd Horgan



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Winners and losers

The Dubai Air Show 2023 was anticipated to be a hotbed for commercial news and aircraft orders, and it didn't disappoint, with a swath of last-minute deals being placed in the closing hours of the final trade day at the show. But orders that had been expected to be identified, particularly with Riyadh Air and Turkish Airlines, remained unsigned without explanation.

By the show's end, commercial airline deals totalled approximately 370, with the clear winner being Boeing. Widebody orders totalled US\$67bn at the Middle East's largest air show.

In four days at the show, Boeing had received 295 aircraft orders compared with Airbus's 86, with the latter openly criticising the performance and cost of the Rolls-Royce engines on its fleet.

The week began well for Boeing with a massive order for the OEM from Emirates for 90 777 widebody jets with list prices of US\$52m, followed by a \$11bn order from Emirates subsidiary and low-cost carrier flyDubai for 30 787 Boeing Dreamliners – a first for the airline.

Dubai is keen to establish itself as the central East-West transit hub and believes widebody, long-haul jets are the future if the Middle East is to defend this market sector against

competition from carriers in Turkey, India and Saudi Arabia.

Analysts at American multinational investment bank TD Cowen believe the increase in widebody orders at the Dubai show “reflects the surge in international travel in 2023; and it favours Boeing, which is stronger than Airbus in widebodies and has snared 50 per cent of the Dubai dollar order value”.

Airbus was clearly on the back foot at the show, which was reflected in Emirates' order for just 15 A350-900s, at a purchase price of \$6bn – a significantly smaller order than anticipated. The airline's president put that down to the cost and maintenance necessary for the Rolls-Royce engines on the Airbus A350. Emirates president Tim Clark told journalists at the air show: “If the engine was doing what we want it to do, and Rolls-Royce knows what we want it to do, and so does Airbus, then it would re-enter the mix of assessment for our fleet plan.

“The 777-9 and 777-8 orders see us expand and extend our network through the next couple of decades, which will take the Boeing 777 order to 205 in total, giving us the tools and the benefit to grow the network. It's very fuel efficient, and it allows us to have a better fit for the type of aircraft we use on some routes. So, we are very excited about the order. We are getting

used to the bumps in the supply chain and are prepared for this. We can deal with network expansion problems and potential supply chain issues.”

Rolls-Royce responded to Clark's comments at the show: “The A350's XWB-84 engine is the best engine out there when you look at efficiency, durability and reliability.”

Regarded as the ‘comeback kid’ within commercial aviation, the Airbus A380 has secured its future until at least the 2040s with operator Emirates, which openly confirmed to journalists at the show that the vast Boeing 777 order will not impact the operations of the A380 – the airline praised the type's ability to carry more than 600 passengers in comfort to its central operating hub.

If further confirmation was needed, Airbus announced it had signed over US\$1.5m in MRO contracts to ensure its A380 fleet remained an operationally reliable platform through its extended life service. Supporting partners within this contract are Collins Aerospace, Lufthansa Technik, Pratt & Whitney and SAFRAN. This service will include a \$1.2m overhaul of the seating across the fleet and the installation of an Airbus Airspace Link HBCplus satellite to enhance connectivity during the aircraft's overhaul. Airbus confirmed that this will involve at least 60 A380s.

Airbus secured two further deals for its Airbus Airspace Link HBCplus satellite



in the desert

with Air Algérie and Air India, which, according to the company, brings the current orders to 71, with five Air Algeria A330neos and six Air India A350-900s.

The freight market is showing no signs of slowing down and a first-time visitor to the show was a B777-300ERSF converted to full freighter configuration and able to carry 100 tons. It is dubbed the 'Big Twin', the largest twin-engine converted freighter on the market. AerCap's head of cargo Richard Greener believes such an aircraft will likely dominate the air cargo market

for the next 15 to 20 years. With the rise in demand for cargo, especially e-commerce and express, there has already been interest in the aircraft from China, along with other partners who have endorsed the programme, such as Emirates Sky Cargo, Cargojet, Altavair and Kalitta Air. There are 65 firm orders for the 'Big Twin' and 50 options. Greener said the programme "is off and running, and we expect certification to be in January 2024, and the first aircraft will go to our launch customer, US-based operator Kalitta Air will

accept the first seven aircraft."

Intended to replace the cargo 747-400 BCF and F variants, Greener believes that within this market, there are more than 200 aircraft that will need replacing over the next ten to 15 years. Having the ability to fly from Hong Kong to Anchorage – regarded as a traditional route for air cargo operators – the Big Twin has a range of 4,500 nautical miles, with a 100-ton payload. All who stepped inside the vast fuselage of the Big Twin couldn't deny that it's a perfect fit for the expanding e-commerce market. **AI**

Commercial Aircraft Orders - Dubai Air Show 2023		
Airline	Type	Quantity
Emirates	Boeing 777-8	35
Emirates	Boeing 787	5
Emirates	Airbus 350-900	15
flydubai	Boeing 787-9	30
Ethiopian Airlines	Boeing 787	11 (15 options)
Ethiopian Airlines	Boeing 737 MAX	20 (21options)
Ethiopian Airlines	Airbus 350-900	11
EgyptAir	Airbus 350-900	10
EgyptAir	Boeing 737 MAX 8	18
Royal Jordanian	Boeing 787-9	4
Royal Air Maroc	Boeing 787-9	2
SunExpress	Boeing 737 MAX 8	28
SunExpress	Boeing 737 MAX 10	17 (45 options)
SCAT Airlines	Boeing 737 MAX 8	7
airBaltic	Airbus 220-300	30 (20 options)
Abelo	ATR 72-600	10 (10 options)



Going nowhere soon, the Airbus A380 is back to stay and will receive a series of upgrades to ensure the type remains in service into the 2040s with Emirates

Skimming into



Back in the early 1970s, US Navy intelligence sources were thrown into disarray when a classified National Reconnaissance Office KH-8 spy satellite image taken in March 1968 showed a sizeable aircraft-looking vehicle, with undersized wings located in a dry dock within the Kaspiysk Special Research and Development Facility on the Caspian Sea.

For the US, the location of what was believed to be an aircraft at the time, and why it was in a drydock, led to countless infighting among US intelligence agencies about what it was and its threat. What was to emerge eventually had the potential to cause a complete re-think as to how US Navy strategy and the use of carrier battle groups would operate in wartime and even require an assessment as to how peacetime cruise deployments would take place.

What the West dubbed the Caspian Sea Monster was designated the KM (Korabl Maket; Russian for Model-Ship) and was an experimental wing-in-ground (WIG) effect vehicle that began testing in 1966 and was continuously evaluated by the Soviets until 1980, when pilot error caused its loss. The KM became the basis for the Lun-class Ekranoplan, designated the MD-160 at entry into service with the Soviet (later Russian) Navy. It was

decommissioned in the late 1990s. The military potential of anti-ship missiles carrying WIG vehicles, or Ekranoplans as they were known, ended when the Soviet Union collapsed in 1991.

Over the following years, countless companies have marketed and built relatively small WIG platforms, mainly for private and recreational use. Still, none have created any interest from the military until now.

A US-based venture-backed start-up company named Regional Electric Ground Effect Nautical Transport (REGENT) has been focused on developing a new generation of WIG aircraft that offer zero-emission, high-speed, coastal transportation. REGENT's first production vehicle will be able to carry 12 passengers at 180mph for a distance of 180 miles. Later models will have the capacity for at least 50 passengers. The company refers to the new platforms as seaglidors, which will operate at 50 per cent of the cost of an aircraft and will be six times faster than a traditional ferry, with less noise.

With investment and co-operation from OEMs and operators such as Lockheed Martin, Siemens, Japan Airlines Hawaiian Airlines and provisional orders or expressions of interest from Southern Airways Express, Brittany Ferries and Split Express, REGENT unveiled its seaglider prototype in April 2021 at CoMotion Miami, Florida.

Sea trials of a quarter-scale model of the full-size, passenger-carrying prototype took

place in September 2022 over Narragansett Bay in Rhode Island and validated the design. At the time, Billy Thalheimer, REGENT's CEO and co-founder, said: "There has not been a new mode of transportation since the helicopter. Seaglidors will bring welcome relief to travellers seeking an alternative to traditional air travel servicing coastal communities such as New York City, the Hawaiian Islands, Barcelona, Tokyo and many more worldwide."

Unsurprisingly, military interest in the seaglider concept resulted in REGENT establishing a Defense Advisory Board with four former senior military leaders from the USMC and US Coast Guard in November 2022.

Tasked with honing the defence applications for seaglidors, Lt Gen George Trautman (ret'd), former Deputy Commandant, Aviation, USMC, one of the four on the advisory board, said at the time: "REGENT's wing-in-ground effect seaglidors have the potential to revolutionise overwater logistics in the littorals. No other technology promises similar range, speed, safety and payload characteristics in an electrically powered platform. I can envision military applications for commercial off-the-shelf [COTS] variants in the near term... for specific defence-related missions in the future."

The USMC sees potential in REGENT seaglidors, announcing a US\$4.75m

USMC service?



MAIN IMAGE:

Would a WIG platform give the USMC the edge in the Pacific and South China Sea, where an island-hopping campaign is predicted should war break out with China? REGENT

BELOW LEFT:

The declassified NRO satellite image taken in March 1968 showed the KM (Caspian Sea Monster) in dry dock at Kaspiysk Special Research and Development Facility on the Caspian Sea US government/National Reconnaissance Office

BELOW RIGHT:

REGENT has already test-flown the world's first all-electric seaglider at Narragansett Bay, Rhode Island. The quarter-scale demonstrator is the final step in proving the feasibility of the technology REGENT



agreement with the service in October to demonstrate the technology within a littoral operating environment. The Marine Corps Warfighting Lab (MCWL) will oversee the demonstration, focusing on the technology for defence logistic operations.

The US Department of Defense (DoD) has a recognised gap within its operational strategy, focusing on the possible war with China in the South China Sea and Pacific regions; both of which may see an island-hopping campaign. With the US Army already planning for more extended range air assault platforms, in the shape of the V-280 Valor – which also mirrors the USMC needs for a fast littoral logistics or strike platform – the seaglider may well meet this requirement, with the ability to carry 12 troops or 3,500lbs of payload up to 180 miles on a single charge.

Being electric makes the seaglider

far quieter than other types in service, which may open up the seaglider or later developments to operate within special forces roles in the future. General Robert Neller (ret'd), who served as the 37th Commandant of the US Marine Corps and is one of those on the REGENT Defense Advisory Board, said: "REGENT seagliders will provide the ability to distribute multiple capabilities in the littoral, including logistics, command and control, and ISR."

The goal of the USMC agreement is to validate the seaglider's ability to operate in each of its hull, foil and wing-borne modes of operation, inform risk reduction and craft-level certification requirements, and understand the vehicle's potential in military operations, including manoeuvre and transport operations. The programme will culminate in a live technical demonstration of the full-scale prototype during a large-scale

exercise hosted by the US government.

As the US looks towards the emerging threats in the South China Sea and the Pacific and the open threats by China President Xi Jinping against Taiwan, Taiwanese foreign minister Joseph Wu believes open conflict will likely occur in 2025 or 2027. His thoughts have been supported by General Mike Minihan, former deputy commander for the Indo-Pacific command, who said his "gut" told him to expect open conflict in 2025.

Such innovations as the seaglider may well see the USMC seeking such radical new technology to extend its presence in the region and this, coupled with the ability to operate faster over the water and almost silently, may well see the WIGs finally get the military validation that they deserved all those years ago, albeit that it was for the 'other side' back then. **AI**



Much has changed in commercial aviation over the last few years. New technologies, such as biometrics, artificial intelligence, machine learning and digitalisation are quickly becoming the norm for airlines and airports.

Many airlines have emerged from the pandemic with shaky balance sheets and

too much debt. Still, they are now making operational profits as the high demand and lack of capacity pushed ticket prices skywards.

In essence, the airline model has not changed much, and while they may be more efficient, most airlines have settled cosily back into the form they were before COVID-19. That's fertile ground for an agile and forward-thinking company such as 777 Partners, the Miami-based organisation

that counts Canada's Flair Airlines and Australia's Bonza among its investments.

The overall strategy of 777 Partners is to create something different, and that means a hyperlocal strategy in partnerships with airports, tourism bodies, governments and the way routes and destinations are selected. It is not about simply connecting two places on a map because it can, but rather connecting communities, marketplaces, and holiday packages by design.





An Excellent Alternative

Michael Doran examines the impact of 777 Partners, an American investment company that's addressing unserved markets within the travel industry through start-up airlines, utilising innovative technology to enable new routes of travel, using more fuel-efficient aircraft, and paying more attention to the customer's needs

The company slogan is 'Plane and Simple'. Flair promotes itself as being Canada's first and only independent ULCC. However, the airline is one of the lowest-rated airlines in North America

Flair

“If Bonza were an atypical start-up airline, they would’ve had to go out to market or source their own technology and paid well above market rates because they’re very small and don’t have a scale advantage”

Manish Raniga, CEO, Airline Investments, 777 Partners

The 777 Partners model

The ethos of 777 Partners is built around disruption and mining the synergies among its businesses for the overall benefit of its portfolio. It describes itself as an “alternative investment platform that helps bold entrepreneurs transform visions into enduring value,” which sums up the development of its Australian low-cost carrier and start-up, Bonza.

Rather than operate a traditional

financing model, 777 Partners believes that for capital to be truly transformative, it must be combined with intellectual, digital and human capital. Its model combines deep sector knowledge, operational expertise, stakeholder alignment and permanent capital to create a unique proposition for founders, management and investors.

The 777 Partners (777P) organisation comprises seven vertical sectors: Aviation, Sports, Media and Entertainment,



Wet leasing and the people effect

Within 777, Partner’s Aviation Vertical is an aircraft financing segment, so, unsurprisingly, the business views aircraft as movable assets that should be where they are needed and generate revenue year-round.

Extreme seasonality means that when demand is at its lowest in Canada, it peaks in Australia, with corresponding ups and downs in aircraft utilisation. For 777 Partners, aircraft are movable factories that generate income when flying, so why not send some Flair 737s down to Bonza in Australia when it needs more capacity for the peak summer season?

From December until the end of February, Bonza is wet-leasing two 737 MAX 8s from Flair and using them to open up services from the new base at the Gold Coast Airport. At the end of the peak season, the two aircraft will return to Canada and

be replaced with two new Bonza aircraft, maintaining the fleet at six 737s.

For the Canadian crews, it will be a prize posting on the tourist mecca of the Gold Coast and an opportunity to learn about and experience some of the innovations Bonza has launched during its first year of operation. Those benefits flow both ways with the net result that a simple wet lease becomes a motivating experience for the pilots and cabin crews, strengthens both airlines and keeps expensive assets generating income.

This exercise is a perfect example of the synergies within the 777 Partners group. One day, Bonza aircraft and crews may head across the Pacific and spend time at Flair, which is a great value proposition for the crews of both airlines and a testament to the innovative ethos emanating from 777 Partners and its airline investments.

Fintech, Insurance, Litigation Financing, Private Credit and Sustainability. It was founded in 2015 and has grown to around 2,000 employees looking after more than 55 brands in over 24 countries, with aviation brands including Flair, Bonza, World Ticket Solutions, FlexFlight, and 347 Green Leasing.

The world of aircraft financing is not prone to seek publicity, and with billions of dollars at stake, much of its best work is done behind closed doors. Typically,

activities at airlines including Alitalia and Air Berlin. One of the aspects that sets 777 apart is its knowledge of the industries it invests in, which is a theme Raniga often returns to.

"We have very deep domain knowledge in aviation and technology, so our technology business is run by travel technology professionals who have built reservation systems and capabilities in that market. They have worked with our FinTech and banking and consumer

"We see Bonza as being so many other things because it's the brand we have created around the consumer, and so the airline is really the ticket to the game, but you are already seeing the evolution of Bonza"

Tim Jordan, CEO, Bonza



financiers or venture capitalists inject a lot of money into a distressed airline and hand it to a new management group charged with bringing it back to health and ready for an initial public offering in the future.

So much more than cash

The 777P model bears no resemblance to that approach, and the best way to understand it is to look at what has happened at Bonza, which, only months after its launch, is flying to 21 destinations on 38 routes from three operational bases. To do that, *Air International* spoke numerous times with Manish Raniga, the Australian-based CEO of Airline Investments for 777P.

Before joining 777 Partners in 2012, Raniga built a 22-year career in aviation and strategy organisations, including senior roles at Etihad Airways, Jet Airways, GoAir, and South African Airways, along with leading transformation

finance business to learn from different industries and the consumer and the retailing aspect of Amazon on how we can bring some of those concepts to aviation."

While there are unique aviation capabilities, the formula focuses on transformation, data science, analytics and developing consumer or fan engagement platforms. Regarding aviation opportunities and finding new markets, 777P has a different approach to traditional venture capital, which it uses to give its brands an 'unfair advantage'.

"We look at markets with a high penetration of digitisation, relatively high disposable income and low low-cost airline penetration," he says. "The concept has always been we're building more than just an airline; we're building a much broader eCommerce travel and lifestyle business to connect an entire ecosystem."

Regarding its airlines, 777P is the



majority owner and operator of Bonza, holding a minority stake in Canada's Flair Airlines and an affiliated stake in South Korea's Eastar Jet through joint-venture partner AIP Capital. The first investment was with Flair, which was previously a charter-type operation but later converted into a low-cost carrier sourcing aircraft on open-market terms from 777P and using technology on an opt-in basis.

Bonza CEO Tim Jordan spent years developing the Bonza model and business plan, but he found it impossible to source viable financing in Australia

when it was right to launch. Jordan also has an extensive aviation management career and was heavily involved in developing FlyArystan, the low-cost carrier of Kazakhstan's Air Astana Group.

Jordan took his plan to 777P, who saw and understood the opportunity for an LCC to connect previously unconnected destinations with a fleet of the latest generation and fuel-efficient 737 MAX aircraft. As a majority-owned, clean-sheet start-up, 777P took a hands-on approach to nurture the vision, opportunity and business plan, working with Jordan to

build something bigger than just an airline taking people from A to B, but rather as a brand synonymous with a much broader consumer base.

"We see Bonza as being so many other things because it's the brand we have created around the consumer, and so the airline is really the ticket to the game, but you are already seeing the evolution of Bonza. Yesterday, it was an airline. Today, it is airlines and holidays; tomorrow, it's going to be a travel marketplace, and beyond that, so much more, so it's the evolution of technology and how we're



Bonza is the first Australian airline to operate Boeing's 737 MAX 8
Bonza

going to engage with the consumer across multiple touch points.”

Bonza Bucks and new aircraft

For example, Raniga talks about the possibility of a future Bonza digital bank that could start with a mobile wallet holding Bonza Bucks while being guided by the deep domain experts in 777P’s Fintech consumer finance vertical. He envisions a multitude of mini start-ups within Bonza that start from somewhere and develop into something more in the future.

In November, Bonza launched operations from Queensland’s Gold Coast airport, its third base supplementing its home at the Sunshine Coast Airport and a base at Melbourne Airport. The peak Christmas and summer holidays are great revenue earners for airlines, so to ensure it captures a share of the riches, Bonza is wet leasing two 737 MAX 8s from sister airline Flair.

Around the end of February, these two aircraft will return to Canada and be replaced by new aircraft, bringing

the Bonza fleet up to six 737-8s as it completes its first full year of commercial operations. Depending on how 2024 turns out, Bonza plans to add another four during 2024 to reach a sizeable fleet of ten by the end of the year, all coming from the existing 777P orders with Boeing.

Perhaps the original order placed with Boeing built some of the mystique that seems to surround 777P; after all, it was ordering significant numbers of 737 MAXs amid the pandemic when many other airlines were scrambling to cancel their orders. That bold and visionary decision is paying off today, with Bonza, Flair and Eastar Jet all having access to new, latest-generation aircraft when they are in short supply.

Going where the money is

The 777P model is focused on transformation and adding value, but at

the end of the day, this is a substantial business that needs to make money to support the growth of its various brands. Raniga says that comes from capitalising and investing in the specific 'profit pools' that 777P believes make that money.

"For example, aircraft financing and leasing make money, and ultra-low-cost carriers are the most successful airline business model that exists, so that's where we invest, and we invest in travel technology because it makes a return on investment and has a multiple well above other things.

"When you string those things together where you own and invest in an airline that uses your aircraft and your technology, your value pool is multiple. And you're also creating the value within the organisation without any leakage by using the cross-vertical synergies, with

the value retained across the group."

An illustrative example is between the Sports and Entertainment and Aviation verticals in Australia, drawing on the inherent synergies of 777P. Bonza has signed a shirt sponsorship with Melbourne Victory, a leading football (soccer) team based in Melbourne that is part of the 777P portfolio. The synergies and cross-pollination opportunities for those two consumer groups are immediately apparent, and that's without counting the mainstream media coverage that comes with Bonza's logo emblazoned across the shirt of an iconic Melbourne brand.

Those tentacles reached even further when Melbourne-based Local Brewing Co. introduced a Victory Draught beer, now the club's Official Beer. During Bonza's massive route rollout in 2023, Victory Draught appeared on the inflight



Boeing order – masterpiece of bold timing

While the pandemic is fading into the rearview mirror, cast your mind back to late 2020 when commercial aviation was grounded, and airlines parked planes wherever they could find a space.

That was when 777 Partners decided to place a significant order for Boeing 737 MAX 8s when it had just one airline affiliate, Flair Airlines, and Bonza was not yet part of its portfolio. This was the time when airlines who had outstanding orders with both Boeing and Airbus looked for ways to ease out of those commitments as completed aircraft awaited delivery.

777 Partners CEO of Aviation Investments Manish Raniga told *Air International* there were three sequences to the order, with the first placed in late 2020, followed by another in the second half of 2021 and a third in 2022. What may have been an opportunistic play when the aircraft were undervalued, and Boeing needed sales has become a

masterstroke in today's environment when new aircraft are at a premium.

777 Partners is incubating three airlines, Flair, Bonza and Eastar Jet, and the 737 MAXs on order are planned to find homes there. However, with Bonza, the only majority-owned airline, any jets going to the other two will be subject to market conditions.

In its Aviation vertical, 777 Partners also has an aircraft financing and leasing business. Still, Raniga says the growth ambitions of all three airlines will consume the aircraft when they come off the Boeing line.

"When you look at Bonza, it will end the year with six aircraft, and it should double that in 2024 and add another 50% in 2025 as per its growth trajectory. On the other hand, Flair has 21 aircraft, and it needs to scale to about 45, and then you look at the world from a very different perspective, and it becomes a very large carrier."

He added that the aspirations for Bonza may be different, and while it may not be the biggest airline, 777 partners want to create a brand and multiple profitable segments around that brand.

"Now, if the market in Australia can digest more aircraft, we will certainly do that, and there will always be levers we can pull in the Boeing order book to be able to service Bonza's needs in the future, but it's not the intention of Bonza being the scale of a Jetstar or Rex."

As a private equity firm, 777 partners would precisely know the value of this deal and the fantastic advantages it brings to themselves and Bonza, Flair and Eastar Jet. To have a steady stream of new fuel-efficient and low-emissions aircraft available is almost a priceless asset and a motivation for each airline to reach its potential, safe in the knowledge that it can add capacity as needed.

drinks menu, introducing another user community to the beer, the football team and the airline linked into the digital ecosystem.

What it means for an airline

Raniga says 777P is using a disruptive model to create a private equity firm of the future, where “you are giving the investments an unfair advantage compared to other private equity investments. This is where we overlay the arts of data science, technology, transformation and automation in the back office to provide and accelerate Bonza to punch well above its weight compared to other businesses that are much larger in scale.”

The net result is that even as a start-up, Bonza has day-one access to the types of performance and consumer data that airlines either take years to develop or pay

we want to evolve?”

“The day we [777P] signed the investment thesis and said we’re going to spend tens of millions of dollars creating this business, we had more than an airline in mind. So developing and moving along that journey and continuing to evolve with the thesis is important for us.”

Can the 777 model be replicated?

During the discussions, it became more apparent that the 777P model is not something most private equity operators would have an appetite for or the technical capability to implement successfully. However, 777P is a model that can be replicated, with the strong caveat that a unique brand and hyperlocal focus are vital.

“We’re about creating a formula we can model to apply all these learnings

Bonza, Raniga is at the centre of Bonza World and works side by side with Jordan and his team to deliver on the promise that 777P initially saw when it decided to back the start-up airline.

So, as this Bonza flight and the discussion draw close, it’s time to ask Raniga what 777P thinks of its investment. He replied, “We’re pleasantly surprised and just as excited as we were on day one.

“Seeing Bonza grow from a plan on a page to where the market did not believe [in] Bonza or an unknown private equity firm to today, where we are firmly on the map in Australia, gives us tremendous validation and confirmation of what we set out to achieve. We are incredibly pleased and proud of what we and the Bonza management team have achieved, which greatly proves our thesis.” **AI**



CLOCKWISE FROM OPPOSITE:

Canada's Flair airline is sending two of its 737 MAX jets to Australia on wet lease to Bonza for the peak holiday season

Flair

Bonza's 737 MAX 8 fleet consists of 186 seats in an all-economy layout, laid out in a three-three configuration

Bonza

Bonza's current operating bases are Melbourne Airport, Sunshine Coast Airport and Gold Coast Airport

Bonza

far beyond a start-up's means to get their hands on, all courtesy of the 777P data science team and their expertise across the various verticals.

“If Bonza were an atypical start-up airline, they would’ve had to go out to market or source their own technology and paid well above market rates because they’re very small and don’t have a scale advantage,” Raniga explains. “We gave Bonza a lot of ingredients and pillars of success as part of its foundation that only a mature airline or business could afford to have.”

Starting an airline comes with plenty of challenges and differences of opinion. Still, after talking to Raniga and Jordan, I believe they work well together and complement each other’s perspectives and experiences. Right now, Bonza is fundamentally a regional airline that has to have the economics of an airline. However, Raniga adds it needs to have one eye on the future: “What do we want to be, and how do

elsewhere because we’re always learning from Flair and Bonza. Very low low-cost penetration, higher digitisation, low connectivity, high per capita income, and a chance to democratise travel is the formula we would use to replicate the Bonza model.”

That comes with the warning that the individual branding needs to be hyperlocal and that the Bonza brand is very colloquially Australian. That brand, personality, partnerships and persona make Bonza stand out.

“You can replicate all of that in New Zealand, South Africa or Eastern Europe and still have fun in each of those concepts,” he says. “Fundamentally, the brand concept is being big, bold, cheeky, funny, authentic and real so that you can create all those aspects in a hyperlocal strategy elsewhere.”

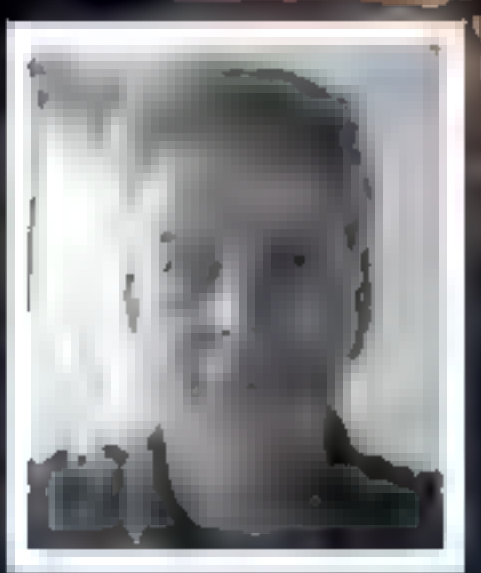
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Glenn Sands

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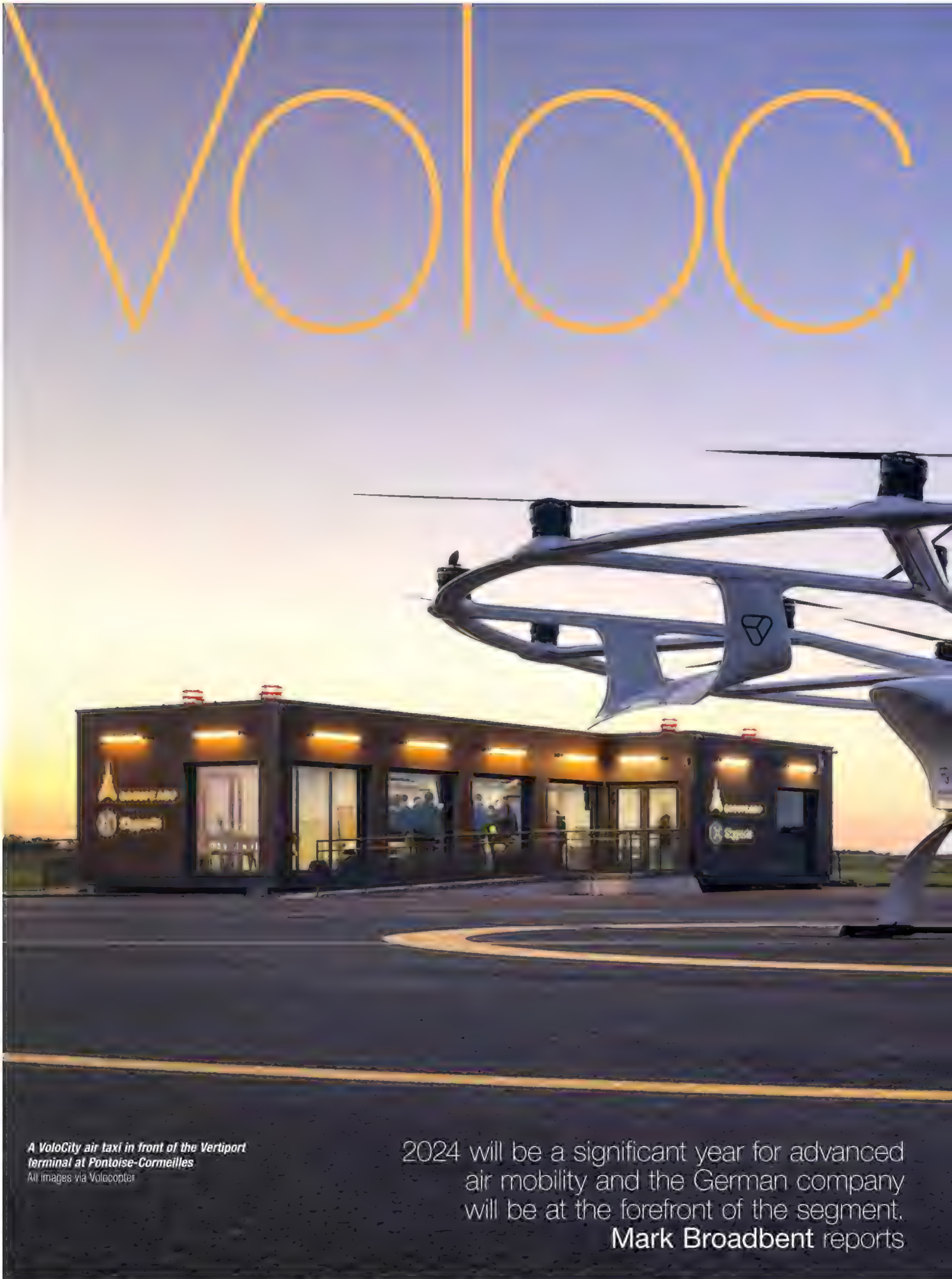
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A VoloCity air taxi in front of the Vertiport terminal at Pontoise-Cormeilles
All images via Volocopter

2024 will be a significant year for advanced air mobility and the German company will be at the forefront of the segment.
Mark Broadbent reports

opter

ready for take off



In recent years, there has been a lot of hype around and investment in a new portion of the aerospace industry called advanced air mobility (AAM, aka urban air mobility or UAM).

Start-up developers and established heavyweights alike are working on

striking electric vertical take-off and landing (eVTOL) systems designed to provide new solutions for passenger and cargo transport.

German company Volocopter, based in Bruchsal to the northwest of Stuttgart, was an early mover in AAM when, in

2011, it undertook the first crewed eVTOL flight. Thirteen years later, having flown several prototype designs, the company is preparing for the world's first eVTOL passenger flights in Paris in the summer of 2024.

Volocopter has developed



family of three eVTOL aircraft for different missions comprising two air taxis, VoloCity and VoloRegion, and an uncrewed heavy-lift cargo drone called VoloDrone.

The company says critical features of its air vehicles are “very stable flight, low and agreeable sound signature [and] zero emissions during flight”. It has also developed supporting infrastructure, the VoloPort and VololQ.

Volocopter says: “By bringing all these components together with strong partnerships, Volocopter will be able to provide solutions for mobility in heavily congested areas and difficult terrain.”

VoloCity

Designed to transport passengers between key public transport hubs such as train stations and airports, the VoloCity air taxi will, Volocopter say, “...fly whisper-quiet and emission-free in the lower airspace” to “enable seamless, faster,

and more convenient options than those afforded by existing transit options”.

The company claims: “VoloCity is more than our first launch product – it’s a veritable game changer. With its clean design and advanced architecture, and the way it integrates technologies, it will go some way towards making big city life more convenient and more sustainable.”

According to Volocopter’s data, the 18-rotor VoloCity is 2.5m in height overall, with an 11.3m diameter on the rotor rim. Each single rotor is 2.3m in diameter. The aircraft will carry two people – a pilot and a passenger.

Structurally, the aircraft is made from carbon fibre-reinforced plastic composites. It uses a brushless direct current electric motor powered by nine packs of exchangeable and rechargeable Lithium-ion batteries.

Total mass is 900kg with a 700kg operating empty weight and 200kg

payload. It will have a 35km range and operate at a top speed of 110km/h.

VoloCity has completed more than 2,000 test flights in its prototype iterations. Initial flights will be piloted, although the long-term aim is for the aircraft to operate fully autonomous services.

VoloRegion

Volocopter’s second air taxi is VoloRegion (formerly known as VoloConnect; the name changed in 2022). This aircraft, the company explains, “...is designed to be an extension of our VoloCity urban air taxi services” by linking a city with its suburbs in “swift, smooth and emission-free flight, taking the urban air experience even further afield”.

It says: “The VoloRegion will bring communities closer together by bridging the gap between cities and their suburbs. Key meetings and other important out-of-town errands will all be within easy reach.”

Unlike the VoloCity multicopter, the



MAIN IMAGE:
VoloRegion’s initial test flight at Bruchsal in 2022

INSET:
The next stage for Volocopter is the VoloRegion four-seater

VoloRegion is a fixed-wing aircraft with a 'lift and cruise' design using six electric motors and rotors and two propulsion fans. According to Volocopter, the configuration provides "inherent stability and high lift-to-drag ratio" that it says will "make for a smooth, fast travel experience with guaranteed comfort".

The company adds: "Its low noise output will minimise any associated pollution and serve to maximise public acceptance. The VoloRegion will boast whisper-quiet and all-electric operation, two of its key features."

VoloRegion will accommodate up to four passengers, have a 100km range, a maximum airspeed of 250km/h and a cruise speed of 180km/h.

VoloDrone

As well as the two air taxis, Volocopter is developing VoloDrone, an uncrewed fully-electric utility drone capable of carrying 200kg payloads.

The company explains: "While there are many design overlaps with the VoloCity, we created the VoloDrone to offer heavy-lift services to a slew of industries, and it will be deployed where classic transportation modes reach their limits."

Volocopter points out: "The VoloDrones will boast a range of up to 40km, meaning they'll easily operate within a large radius. And given their immense payload, this opens up a world of possibilities."

VoloDrone will have what the company calls a "flexible equipment system", enabling it to carry various heavy loads, opening potential for the system in different heavy-duty retail transport or logistics applications.

Volocopter says: "The VoloDrone will also assist with daily operations, like building sites. Its high payload makes it ideal for tasks in construction, maintenance and site planning. In moments of need, the VoloDrone will be

quickly deployed to provide disaster relief, air rescue, or support humanitarian aid efforts. The VoloDrone will also offer top-class shore-to-ship deliveries."

VoloPort and VoloIQ

Volocopter aims to create a complete UAM ecosystem. It says: "We like to look at the big picture. All of our systems feed into an overarching ecosystem that will help us bring urban air mobility to life."

VoloPort is the name of the vertiport the company has developed to serve as the operational hub for its eVTOLs: "If we want to ensure the success of urban air mobility and air taxi operations, it's imperative that we create flexible vertical take-off and landing infrastructure in megacities across the globe. Volocopter's vertiport design is cost-efficient, modular and flexible, meaning it can be adapted for use on the ground, at sea or on a raised platform."





VoloPort includes all the facilities future vertiports will need to function – passenger processing, embarkation and disembarkation, infrastructure for battery storage and charging, eVTOL aircraft fleet management, maintenance, repair and overhaul, communications and air operations.

Volocopter built an early concept, VoloPort, in Singapore in 2019, which, the company says, “enabled us to test the entire customer journey with a view to delivering an excellent passenger experience. We showcased everything from the customer services we envision through pre-flight checks, passenger lounges and boarding procedures”.

Volocopter comments: “We believe that the infrastructure expertise we’ve amassed in-house is a crucial success factor for urban air mobility.” The company has developed a vertiport handbook providing guidance to third-party infrastructure

builders and worked with the European Union Aviation Safety Agency (EASA) on developing vertiport requirements.

The company also constructed a purpose-built vertiport at its Bruchsal base as an operational testing facility for gathering data, performing simulations and building confidence among partners and authorities in the company’s capabilities.

Additionally, Volocopter has developed and tested digital software called VoloIQ. The company explains: “This cloud-based platform will manage everything from our VoloCity air taxis to our urban integration efforts and passenger app. Even weather conditions will be monitored.

“We are building this intelligent and integrated system to harmonise the totality of our operations. It is our very own aerospace cloud platform and will offer full transparency for the complex urban air mobility ecosystem in real-time.”

Critical features of VoloIQ include

a booking platform for customers, connectivity and management tools (including artificial intelligence-driven services for aircraft and maintenance). Volocopter partnered with Microsoft to develop VoloIQ and the system uses the IT giant’s Azure cloud computing technology.

Regulatory path

Volocopter emphasises VoloCity and VoloRegion are designed to meet the current exacting aviation standards and requirements EASA sets.

Advanced air mobility developers must attain a Design Organisation Approval (DOA) and a Production Organisation Approval (POA).

A DOA shows that the initial design, modification or repair of an aircraft meets all the requirements for certification, environmental protection and operational suitability. A POA calls for the implementation and maintenance





of a quality control system guaranteeing that a manufacturer's production facilities adhere to the approved production data.

Volocopter says: "Put simply, the DOA certifies the creation process for the aircraft design, while the POA allows the company to move from design to production."

Applicants must undergo a multi-stage process to qualify for the approvals. During this process, which can take up to two years, EASA audits all relevant aspects of the applicant company and its processes. The applicant must ensure every department, process, and system meets the high standards applied to airline operators.

The ultimate awarding of the DOA and POA constitute a significant seal of approval, expressing as they do EASA's recognition of a company's high quality across its design and production setup.

Volocopter was granted DOA (EASA Part-21 J) in 2019 and POA (EASA Part-

21 G) in 2021, becoming the first eVTOL company to have received both DOA and POA approval from EASA.

The next step in the regulatory path for Volocopter is to attain type certification for VoloCity. EASA has received several requests for a 'type cert' of eVTOLs. The agency notes these aircraft differ from conventional rotorcraft or fixed-wing aircraft: "In the absence of certification specifications for the type certification of this type of product, a complete set of dedicated technical specifications in the form of a special condition for VTOL aircraft has been developed."

These specifications are known as Special Condition (SC) VTOL enhanced. The agency says: "This special condition addresses the unique characteristics of these products and prescribes airworthiness standards for the issuance of the type certificate, and changes to this type certificate, for a person-carrying

VTOL aircraft in the small category, with lift/thrust units used to generate powered lift and control."

Test and demonstration

Volocopter's air vehicles have passed several milestones. Following various test and demonstration flights using its 2X aircraft (the forerunner to VoloCity), the company test-flew the first examples of both VoloCity and VoloDrone for the first time in 2021. VoloRegion undertook its maiden flight a year later.

In 2022, VoloDrone completed remotely piloted flights at the DLR National Experimental Test Centre for Unmanned Aircraft at Germany's Magdeburg-Cochstedt Airport in the EASA CORUS-XUAM project.

This initiative is developing digital air traffic and uncrewed traffic management interfaces for the seamless operation of eVTOLs alongside existing aircraft in the same lower airspace – crucially



The routes around Paris that the VoloCity will fly in the summer of 2024

Volocopter said the 2X tests at Tampa were the first time an eVTOL had flown at a major international airport

L-R: Damien Cazé, Director General Civil Aviation, Volocopter CEO Dirk Hoke, Présidente de la Région Île-de-France, Valérie Préresse, Groupe ADP, and Deputy CEO Edward Awkwright

Expanding global footprint: a 2X airborne over Saudi Arabia in 2023

“These first routes will bring the greatest insights into the UAM market yet, allowing the public, partners and stakeholders to familiarise themselves with this new form of mobility”

VoloDrone is designed to carry 200kg payloads up to 40km

important integration in ensuring safe and efficient operations by AAM aircraft at scale.

The tests saw VoloDrone physically fly at Cochstedt. Still, the flights used simulated digital airspace scaled down and mapped to fit the physical space of Cochstedt of Frankfurt and London/Heathrow Airport. The exercises tested how eVTOLs would yield to priority traffic and change flight speeds for traffic flow management at a major international airport.

In November 2022, Volocopter inaugurated a VoloPort at Pontoise Cormeilles Airport outside Paris in a joint venture with the French Civil Aviation Authority, the Parisian airports operator Groupe ADP and Skyports Infrastructure.

Volocopter demonstrated the integration of the VoloIQ digital software in the facility and flew its 2X prototype aircraft to showcase a full customer

journey through the VoloPort, from booking, boarding and taking flight.

Paris flights

In summer 2024, Volocopter will be involved in probably the most notable event the AAM industry has yet seen anywhere worldwide – the first public eVTOL services.

A VoloCity aircraft will be used in cross-city flights in Paris next summer, coinciding with the Olympic Games. There will be three routes – Paris/Charles de Gaulle Airport to Le Bourget Airport, Paris Heliport to Austerlitz in the city centre, and Paris Heliport to Saint-Cyr-l'Ecole Airfield in Versailles. There will also be roundtrip flights operated from Paris Heliport and Le Bourget.

According to Volocopter: “Each vertiport will feature passenger terminals, with one to three take-off and landing spots, and integrate the learnings from the Pontoise testbed. More than 1,000

visitors have come to see dozens of flights and other tests that have been executed.”

The VoloCity operating the services will fly “at heights below 500m” (1,640ft) during the trials but “will not be audible from ground level in urban environments”, the company says.

Volocopter summarises: “These first routes will bring the greatest insights into the UAM market yet, allowing the public, partners and stakeholders to familiarise themselves with this new form of mobility.”

Global footprint

Volocopter has made an impact worldwide in the last year. In March 2023, the company announced the Japan Civil Aviation Bureau had accepted its application for concurrent type certification of VoloCity in Japan. Volocopter is committed to flying its VoloCity air taxi at the 2025 EXPO Osaka Kansai.

Sumitomo Corporation has invested in Volocopter’s Series E Funding round and



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will become a strategic partner for VoloCity's planned entry into service in Japan.

Spring 2023 saw Volocopter operate a series of air taxi test flights in Saudi Arabia in the culmination of an 18-month partnership with regional development agency NEOM and the General Authority of Civil Aviation, exploring a UAM ecosystem in the kingdom.

At the June 2023 Paris Airshow, Volocopter announced a collaboration with ADAC Luftrettung to customise eVTOLs for emergency medical services (EMS) work. ADAC will purchase two VoloCity aircraft that start operations in late 2024, supplementing ADAC Luftrettung's EMS fleet in Germany.

ADAC Luftrettung has signed options on securing 150 additional VoloCity vehicles for EMS work. Volocopter says: "Upon successful completion of these first operations, the additional eVTOLs will be considered for use in future

rescue missions."

Another Volocopter announcement at the 2023 Paris Airshow was an agreement with Safran Electrical and Power to collaborate on developing a next-generation powertrain for eVTOLs.

This agreement covers exploring commercial and engineering partnerships on the electric powertrain, ranging from the electrical propulsion system, battery units and power distribution system to wider engineering services.

In September 2023, Bristow Group Inc. and Volocopter signed an agreement to explore and develop passenger and cargo services for eVTOLs in the United States and the UK. Bristow has placed a firm order for two VoloCity aircraft to be delivered after certification, with an option to purchase a further 78 vehicles in the future.

A statement said: "Both parties will begin immediate co-operation to build a UAM ecosystem that includes regulatory

discussions, infrastructure exploration and local partnership building."

Two months later, Volocopter demonstrated a crewed 2X in flight tests at Tampa International Airport in Florida – the first eVTOL flight at a large, operational international airport in the US.

The Tampa flights highlighted Volocopter's partnership with Bristow as Florida is one of the targeted areas of operation in the US. Volocopter had previously undertaken test and demo flights in Las Vegas, Oshkosh and Dallas-Fort Worth.

Volocopter notes: "Continued and visible flight test campaigns in view of the public are crucial steps to building an efficient UAM ecosystem that receives communities' support.

"This includes cities, infrastructure developers, operators, air traffic authorities and lawmakers to push this new form of electric urban aviation to scale in the US." **AI**

RIGHT:
*Skynest will give economy passengers somewhere
to catch up on their sleep*
All images via Air New Zealand unless stated

BELOW:
*Returning the 777s to service was a priority as the
airline raced to restart operations*



Now that global airline capacity is within touching distance of pre-pandemic levels and almost all travel restrictions are gone, competition is heating up, particularly on long-haul international routes.

New Zealand is once again welcoming visitors from all parts of the globe, and the major network airlines in Asia and North America are seeing incredibly high demand now they have the long-haul aircraft and capacity needed back in service.

Air New Zealand flies from an end-of-the-line destination not directly on the road to anywhere, is not at a transit hub and has a home market of just 5.2 million people. However, throughout its history,

the airline has consistently outperformed bigger and more highly resourced competitors, so what makes it a winner?

Doing a lot with a little is something Air New Zealand learned very early on when it started life as Tasman Empire Airways Limited (TEAL) in 1940. Running an international airline is not simple, but Air New Zealand is successful because it is consistently better at one thing than almost any other airline.

And that's innovation. Innovation on things that actually matter to its customers wherever they are sitting on the aircraft, not just the fortunate few at the pointy end, although it does look after them rather well.

Innovation at Air New Zealand means finding out what customers want before they know they want it and then

partnering with other innovators to design the experience. There is no better example of this than the Skynest sleeping pods in economy that will feature on future Boeing 787s, but more about those later.

During the COVID-19 pandemic, Air New Zealand lost around NZ\$1.2 billion (£580 million) but turned that around in the financial year ended June 2023 to make a pre-tax profit of NZ\$574 million (£279 million).

Compared with pre-COVID 2019, the airline carried 11 per cent fewer passengers, increased revenue by nine per cent and profit before tax by 50 per cent. For the first quarter of the new financial year, Air New Zealand said it was facing some stiff headwinds to match last year's performance, ➔



DESTINATION: *INNOVATION*

Air New Zealand's chief customer and sales officer, Leanne Geraghty, spoke to **Michael Doran** about how the airline's new initiatives are helping to get the operator to the right route



Going green: 'A wicked problem to be solved'

A year ago, Air New Zealand (Air NZ) set its roadmap towards net zero emissions by 2050. CEO Greg Foran said getting to net zero is "one of these wicked problems we need to solve", and just putting up a target will not be good enough.

Foran wants the airline to lead the world in reaching this ambitious goal, and he made it clear that not knowing how to do it today does not impede finding solutions in the future.

He added that being curious is part of the airline's DNA, so solving net zero is just another challenge to be beaten. In December 2021, Air NZ developed a Product Requirements Document that it shared with the world, and from that, 30 aircraft developers submitted proposals. The airline has 23 Bombardier Q300 turboprops to begin replacing in 2030 with more sustainable aircraft, such as hybrid electric or green hydrogen. On that road, it wants to fly its first zero-emission commercial demonstrator flight in 2026. At a recent conference, Foran said that while an electric aircraft is not a commercially viable solution, "it's the beginnings of the journey where you can get in early, test something and see how it goes".

It's likely the airline will buy some electric aircraft and use them for short-haul freight to understand the infrastructure that's required, but Foran is aiming to work closely with partners to solve a green hydrogen electric aircraft. He pointed to Universal Hydrogen in the US, which has already fitted the system to a Q300: "I like the approach we are taking, which is 'learn, take another step and learn'. We have a sense of where we're heading, but don't have the final destination exactly locked in, and that's how we get on and do stuff."

particularly with the price of fuel once again rapidly spiking upwards.

Competition is building

Air International interviewed Air New Zealand chief customer and sales officer Leanne Geraghty, and we started by asking how demand was holding up on both the international and domestic operations.

"From a capacity perspective, we're near pre-COVID levels, but we acknowledge we've got some headwinds coming our way simply because of the well-documented Pratt & Whitney engine issues. We're still seeing excellent and strong demand across our long-haul markets, and it's solid for US travellers wanting to visit New Zealand."

One thing airlines can't control is exchange rates. At the moment, New Zealand is a relatively inexpensive destination for North American travellers, but conversely, the US is expensive for Kiwis. That encourages more inbound travellers but less outbound, although plenty are still heading to lower-cost destinations with favourable exchange rates, like Bali and Japan.

Auckland Airport is the home of Air New Zealand (Air NZ) and this summer, there will be 26 per cent more capacity on US routes than before the pandemic. There will be seven airlines flying nonstop to eight North American cities with 27 more weekly flights than in January 2020.

The North American carriers flying to NZ are Air Canada, American Airlines, Delta Air Lines, Hawaiian Airlines and United Airlines, with Qantas and Air NZ also in the mix. For Geraghty, that means "doing all of the things that we've always done to maintain our position in the market with those other carriers entering the market over the coming months."

"It is really a moving picture as we see new entrants coming in, and we see other competitors that have been in the market

changing their capacity and shifting around frequencies, so very much a moving feast at the moment."

Air New Zealand has moved some of its focus away from Asia and towards North America. That strategy is proving a success and giving the airline the firepower to withstand the competitive onslaught of the large US carriers.

Over the last year or so, it has built up its North American network and now operates more than 30 nonstop weekly services to seven cities. From Auckland, Air NZ operates its 787s or 777s to New York, Chicago, Houston, Los Angeles, San Francisco, Honolulu and Vancouver.

Delivering what you promise

Many airlines restarting after the pandemic have struggled to find the balance between adding capacity and operational capability, with some pretty epic fails just across the Tasman Sea in Australia.

When the pandemic arrived, the New Zealand government took swift action to close the border and limit internal travel, leaving Air NZ with almost nowhere to fly. In common with other airlines, this meant putting aircraft into storage, and for Air New Zealand, that included most of its Boeing 777s heading for the desert.

When the call came to get operations restarted, the airline had around four weeks to resurrect services to Australia and just another two weeks to start flying to designated visa-waiver countries.

Getting aircraft out of storage is never quick, whether they are in a hangar or a desert, and finding pilots and cabin crew whose licences were current at short notice made it more difficult, as did the supply chain disruptions in the maintenance world.

At the end of June this year, Air NZ had a fleet of 106 aircraft, and it expects that to grow over the next four years to 116, with the additional aircraft being 787

Dreamliners and Airbus A320/A321neos.

The widebody fleet includes 14 787-9 Dreamliners and seven 777-300ERs, while short-haul and domestic services utilise 17 A320s, six A320neos and ten A321neos. For its regional operations, the airline uses 29 ATR72-600s and 23 Bombardier Q300 turboprops.

While Air NZ is continually assessing new markets, its network strategy has been to ensure it has the stability and schedule reliability to meet its promises and deliver operational integrity for customers.

“There are some routes where we haven’t got back to pre-COVID frequencies, as an example, so our focus is on actually making sure that we are optimising our existing network rather than taking on short-term opportunistic routes. So that’s where our effort is being concentrated for the immediate to medium term.”

Loving the nonstop to New York

Australian flag carrier Qantas has developed its Project Sunrise, which will link the east coast of Australia to London and New York City with nonstop flights. In the interim, Qantas launched nonstop flights from Perth to London Heathrow in 2018, and this summer will also offer nonstop services from Perth to Paris and Rome.

In September 2022, Air New Zealand pioneered the nonstop route between Auckland and New York. While there were some teething issues around prevailing winds and payloads, the service has matured into an outstanding success. Air NZ uses the 787-9 Dreamliner, which takes around 16 hours between

LEFT:

With 32 A320s currently in service, Air New Zealand has three A320/321neo models on order which are due to arrive in 2024

Airbus

BOTTOM:

To hit its zero emission targets, the airline plans to replace the Q300s with clean technology



“We know that sleep and rest is something that customers look for on those long sector length flights”

Leanne Geraghty,
chief customer and sales officer,
Air New Zealand





Auckland and New York, while the return flight is generally in the air for about 17 hours.

Having longer-range aircraft that are capable of flying 20+ hour sectors is one thing, but how do passengers feel about such a long flight? Geraghty says giving Kiwis the opportunity to arrive in New York on a nonstop service, or one stop from Australia, has been really well received.

"We get feedback all the time, and people absolutely love the fact that it's a nonstop flight. It's lengthy, but the way the service flows helps, and we've taken this sector very much into our consideration for when the new 787

Dreamliners arrive."

Kiwis and Aussies usually head west to get to Europe. Still, this new route is proving to be a viable option by using New York as a transit point to the UK or Europe rather than the usual transits through Singapore or the Middle East.

In June this year, Qantas launched its own no-stop between Auckland and New York, which connects with several Trans-Tasman flights to and from Australia. The attraction of that flight is that passengers get to fly over Los Angeles rather than transit through the busy West Coast hub.

Lie flat and sleep in economy

In September 2024, Air NZ expects to receive the first of eight new 787 Dreamliners, which come with a completely redesigned interior, including the much anticipated and world-first Skynest sleeping pods.

In June, Air NZ released details of the new interiors and said the new Dreamliners would give customers more choice than any other airline and provide the best sleep in the sky, regardless of which cabin they fly in.

That last sentence is a real insight into innovation at Air New Zealand. It talks

MAIN IMAGE

Air New Zealand is crazy about rugby, and the airline's sponsorship of the New Zealand Rugby Football Union, including the All Blacks, saw its first A320 sporting a sleek black livery complete with a silver fern motif and Koru on its tail. The distinctive aircraft serves on the airline's domestic routes

Airbus

BELOW

The versatility and reduced emissions of the A320/A321neo has been well proven





about the importance of sleep for everyone, rather than the usual airline focus on fully lie-flat beds and giant screens in premium cabins.

"Research shows us the first night away from home is the hardest to get a good night's sleep, so everything we do on board is to help create a sense of calm," says Geraghty. "From the lighting and sleep ritual including sleepy teas and balms to the healthier food choices and breathable fabrics."

Over five years, the airline carried out extensive customer research that highlighted the importance of sleep and the need for more space and comfort. Air NZ said the new 787 cabin is designed around creating a home away from home that leaves customers refreshed and raring to go to their destination.

"Knowing the sector length of the nonstop between Auckland and New York, the team looked at how they could provide a sleep option for every customer on board, and that's the impetus behind Skynest. It's fabulous and provides an

opportunity for economy and premium economy customers to have a lie-flat experience."

The Skynest will be between economy and premium economy and consists of six lie flat beds stacked in three tiers. Each bed is 203cm (80in) long and comes with sheets, blankets, a pillow, a reading light, a USB outlet, a ventilation outlet, soft lighting and a curtain.

"We know that sleep and rest is something that customers look for on those long sector length flights, and Skynest was our way of ensuring that we provided the option for customers, no matter where they were on the aircraft, to get a good night's sleep."

New 787 cabin experience on the way

Air NZ has described the new 787 interiors as the Cabin of Possibility, with no less than seven accommodation



RIGHT:

The 787 Premier Luxe has easily enough room for two to dine together

BOTTOM:

The new 787 Dreamliners will give passengers more sleeping choices than any other airline. The airline has 14 in operation and eight on order

choices. Starting at the top, Business Premier Luxe is a fully private suite with extra space, a larger meal table, a buddy seat for two to dine and a fully closing door.

Business Premier is fitted with a sliding panel to give extra privacy without fully enclosing the space. It has multiple individual storage spaces, USB power outlets, a 24in personal screen, Bluetooth audio streaming and a longer bed with a memory foam mattress.

Premium Economy offers that little bit of luxury with more privacy and protected space so passengers can recline at leisure without interrupting the person behind. The seats have generous sized armrests, a leg rest and an extendable footrest to help catch up on sleep.

We have covered the Economy Skynest, which can be booked for set periods during flight, although the finer details on pricing and times have yet to be officially released. Geraghty told

Air International that the product won't come on sale until the airline confirms when the new 787 Dreamliners will enter service.

She added that the response to the launch of Skynest has been phenomenal, and although it has been some time since it launched, there's still such huge interest in the new product: "I think it's actually a great product that talks to the innovative nature that Air New Zealand is very well known for."

Economy Skycouch is where the three seats are booked as a block and changed into a couch after take-off, which can be shared with a partner or children or kept as a single bed. The seats are the same as economy but have a unique footrest that can extend to create a large couch space.

The final two options are Economy Stretch, which has extra legroom, and Economy, which has been designed with more storage, a 50 per cent bigger

screen and a Bluetooth connection to pair personal devices.

A final look at how Air New Zealand sweats the details is its search to replace the snacks it serves on board. It has spent nearly a year calling for local producers to develop uniquely Kiwi snacks and recently called out to the public to help it close the deal.

The airline wanted to recruit a panel of five Snacksperits to taste-test the shortlisted products and received more than 9,000 applications from around the country to join the panel. The final five included an 81-year-old and a ten-year-old, and the new snack menu will be introduced later this year.

While there is an element of fun to this, it also shows how the airline involves the Kiwi community in what it does and its absolute commitment to every part of the passenger experience, be it a new 787 Dreamliner, Skynest or a humble snack. **AI**



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Structuring support for the airframe

Keeping aircraft airworthy is a considerable challenge.
Bernie Baldwin learns from some of the major
players about the market for this
work and how to achieve it



Maintaining an airframe is a costly business. The work can take a sizeable chunk out of an airline's overall budget. Those providing such support need to know the market and make wise investment choices to deliver their services and meet customer requirements related to cost, quality and turnaround time (TAT).

Like many industry sectors, the global market for significant airframe overhaul underwent a turbulent period during the COVID-19 pandemic. However, most of the worldwide fleet has returned to

service post-pandemic and is entering a growth phase.

Assessing the market, Juozas Lapeika, deputy CEO for production management at FL Technics, said aviation is facing considerable demand for comprehensive maintenance services, particularly in the realm of heavy maintenance: "This reflects a dynamic post-pandemic market landscape," he said. "Traditionally, such circumstances would pave the way for the growth and expansion of MRO [maintenance, repair and overhaul] businesses, associated with an escalation in market capacity. However, the industry has to confront workforce and supply chain challenges."

Lufthansa Technik has invested heavily in its Malta facility where it provides line and base maintenance services for short-haul and long-haul aircraft in the Airbus A320, A320neo, A330, A340 and A350 series

All images via Lufthansa Technik unless stated

OPPOSITE:
*Getting to grips with the A380 airframe at
Lufthansa Technik Philippines*

BOTTOM:
*Lufthansa Technik Malta is one of the groups
specialist facilities for A350 maintenance*

"It should be noted that while MROs possess the financial capacity to invest in modern facilities, the critical impediment lies in the scarcity of a skilled workforce. The industry, therefore, grapples with a paradox wherein the lack of qualified personnel constrains the potential for infrastructure enhancement. This disconnection poses a substantial obstacle to the realisation of the full growth potential within the MRO sector," Lapeika added.

"Moreover, the complexity of the supply chain exacerbates these problems, making MROs' struggles even more apparent. The smooth operation of maintenance procedures depends on the prompt and effective acquisition of necessary parts and supplies. But the current complexity of the supply chain creates a bottleneck

that prevents maintenance tasks from being carried out efficiently."

Positive recovery

Marcus Motschenbacher, vice-president and chief commercial officer of aircraft maintenance services at Lufthansa Technik (LHT), said the market for major airframe overhauls is "currently extremely vibrant", both for narrowbody and widebody aircraft types: "We certainly expected the post-pandemic recovery of air traffic to have a significant influence on the overhaul business, but the extreme pace at which the business returned indeed surprised us," he said. "Hence, our capacities are still completely booked and will be that way for the foreseeable future. Even historically low summer inductions cannot be seen. Most of the customers are now looking for long-term deals to secure capacity/slots.





"From my point of view, some of the factors leading to the current capacity situation were foreseeable, such as the fact that significant numbers of previously stored aircraft would return with deferred base maintenance requirements. However, there also were rather unforeseeable factors such as the delays in the delivery schedules of various new-built widebody types," Motschenbacher added. "This development has prompted airlines to operate their legacy aircraft types, which have higher maintenance requirements, for much longer than initially planned."

Back in the game

He said a significant surprise in this area was the resurrection of the Airbus A380: "For this aircraft, the airframe MRO demand is still going through the roof, mainly due to a worldwide shortage of the respective MRO capacities.

"One interesting development in this regard is that major superjumbo operators such as Emirates – which has previously done all its A380 MRO work in-house – are now outsourcing additional airframe MRO capacity, for example, to our subsidiary in Manila. The current wing spar service bulletin issued by Airbus and the fact that many A380s are reaching an age that requires the most comprehensive 12-year checks are driving the capacity situation even further.

"I expect all these factors to remain important and to drive airframe MRO demand well into the coming years," Motschenbacher said.

Jon Morgan, senior director of bids and proposals at Aviation Technical Services (ATS), agreed with his LHT counterpart when observing the sector scenario: "The global market for major airframe overhaul is very vibrant," he said.

"Worldwide capacity remains limited with many long-term maintenance contracts already in place, making it very difficult

for airlines and lessors to find MRO capacity for any new maintenance or modification work. The addition of new aircraft deliveries and reconfiguration requirements for leased aircraft is compounding the strain on MRO capacity," Morgan added.

Premier Aviation's vice-president of sales, marketing and services, JC Tewfik, reported that the company has been very busy since September 2020 and has not seen any slowdown in the market: "Our customer base is filling up our pipeline, and we need to manage our capacity very tightly. I do not think there is enough good capacity out there; hence, there are shops that are not being used to their full capacity, and the good ones are currently full," he said.

Solid strategic investments to aid the task of delivering for customers are essential. New sites, new aircraft types in the portfolio, more hangar space, implementation of technologies new to a company, and staff training are always areas under consideration. Premier Aviation is undertaking one such venture: "To respond to the additional request from our current customers and the new ones approaching us, we have announced an expansion into a brand new facility," Tewfik said.

The Quebec City, Canada-based company will open a second location in Bay County, Florida. Thus, at Northwest Florida Beaches International Airport, ground has been broken on a facility that will involve more than CAN\$32.5 million of capital investment and create around 250 high-value jobs over the next four years.

Known as 'Project Maple' in a nod to Premier's Canadian roots, it is the result of two years of efforts by the airport and Bay Economic Development Alliance to expand the region's aviation sector.

Tewfik reported that Premier wants the Bay County operation to become its centre of excellence on Embraer and

“It should be noted that while MROs possess the financial capacity to invest in modern facilities, the critical impediment lies in the scarcity of a skilled workforce”



ATR products: the ERJ 145, E175 and E190 and the ATR 42/72 turboprops. The company is expecting to hire ten employees in 2024 and 80 each year until 2026. Construction of the two-bay, narrowbody hangar is ramping up, with completion planned for summer 2025.

On the personnel side of the facility, nearby Haney Technical College will facilitate tailored courses in aviation maintenance. The college trains students in both aviation airframe mechanics and aviation powerplant mechanics. In recent times, the 40-50 aviation mechanics trained each year have had to leave the community to find work, but Premier Aviation's move into the area will help reverse that trend.

According to Motschenbacher, to meet the aforementioned high post-crisis demand for airframe maintenance, LHT has made two significant investments



in its global base maintenance network over the past year: “One was the mid-July inauguration of a third overhaul line for the Airbus A380 at our subsidiary Lufthansa Technik Philippines (LTP) in Manila. Although during the pandemic, the superjumbo was pronounced dead by many, its rather unexpected comeback in the fleets of various airlines now lets us expect a steady influx of A380 heavy checks for several years to come. The third line is hence a reasonable investment, even more so as LTP faces only limited competition for overhauls of this aircraft type,” he said.

“The other major investment, announced recently, is the build-up of comprehensive Boeing 787 overhaul capacities at Lufthansa Technik Malta (LTM) from the end of 2023. With the Dreamliner we have added to LTM's capability list, already containing the A350 – the

Mediterranean island not only fosters its role as our European centre of excellence for widebody aircraft overhauls, but it also once again served aircraft of both major manufacturers, having recently been an all-Airbus heavy check base,” Motschenbacher added.

FL Technics' investments have been focused on more than ‘bricks and mortar’, according to Lapeika: “Recognising the pivotal role played by skilled personnel in the aviation maintenance landscape, we are committed to cultivating a workforce of the highest calibre.

“This is achieved through targeted training programmes aimed at enhancing competencies in critical areas, such as welding, painting facility operations, engine shop expertise and proficiency in wheels and brakes maintenance. Our committed dedication to continuous



learning ensures that our personnel are adept in handling the new aircraft types, aligning our services with evolving industry standards,” he said.

Providing the right tools has not been overlooked, though: “Our commitment extends to the meticulous maintenance of existing equipment, safeguarding operational integrity and longevity. This includes a conscientious approach to upgrading workplaces and facilities, which fosters an environment conducive to optimal performance. By integrating cutting-edge technologies and adhering to the highest industry benchmarks, we pledge to deliver a high-quality customer experience characterised by efficiency and reliability.”

A place to work

Finally, although it may not have been the sole focus, some ‘bricks and mortar’ investment has occurred. Lapeika said: “An integral part of our strategic vision involves the augmentation of our operational capacity. The investments made in expanding existing facilities, exemplified by the new developments in Punta Cana and Bali, are proof of our commitment to growth.”

At Punta Cana International Airport, the second-busiest airport in the Caribbean, the company is creating a facility that will include five bays for base maintenance operations, including a complex of supporting shops. The facility’s total area of 52,000m² will consist of 20,000m² for the hangar and bays. The construction process will take up to two years, so a 2025 opening for the whole complex is expected.

Meanwhile, in a joint venture in Indonesia, the company’s subsidiary there, FL Technics Indonesia, will work with PT Angkasa Pura Properti and PT Angkasa Pura I (Persero) to develop a 17,000m² MRO hub at I Gusti Ngurah Rai International Airport in Bali.

Juozas Lapeika, deputy CEO for production management at FL Technics
FL Technics

An Airbus A350 enters Lufthansa Technik Malta for base maintenance work

Lufthansa Technik expects a “steady influx of A380 heavy checks for several years to come”



RIGHT:
*Lufthansa Technik Philippines opened a third A380
overhaul line in July 2023*

BOTTOM:
*Third-party work on the A380 looks set to increase
at the Lufthansa Technik Philippines facility. In
March, Emirates signed two major MRO contracts
for landing gear and base maintenance such as
C-checks for its fleet*

The initial stage of the project is set to be finished within a year. The new infrastructure will eventually have a hangar with six bays to maintain narrowbody aircraft, supported by purpose-built production shops and offices.

At ATS, as the demand for MRO services continues to outpace the supply of newly skilled and experienced maintenance workers, the company is another to prioritise investing in its people, according to Jon Morgan: "We launched our apprenticeship programme in January 2019 at our Everett, Washington state site, operating the 18-month programme throughout the pandemic and to this day," he said. "Employees train on the job while getting paid and have the option to become a certificated mechanic on completion.

"The programme is also offered now at our Kansas City, Missouri and Dallas/Fort Worth, Texas locations. As of September 2023, we've graduated 150 apprentices in the programme, and approximately half have become certified with the FAA. We look forward to increased awareness of the aircraft maintenance technician career path and partnering with airlines, competitors, industry influencers and politicians to bring more individuals to the career," Morgan added.

Turnaround times are vital for aircraft operators, so the MRO providers regularly develop their own new processes and procedures – or adopt some – to help improve those times, improve the quality of airframe repair, reduce costs or, if possible, any positive combination of the three.

Morgan said: "At ATS, approximately 70% of our heavy maintenance and 100% of our component repair workloads are processed through digital technology, bringing efficiencies and notable sustainability advancement. Additionally, we are seeing the increased acceptance



of PMA materials used during repair work in both airframe and component repair workshops, helping to reduce cost and shorten span times."

Technology impact

The 'digital element' is equally important to Lufthansa Technik, Motschenbacher said: "In my opinion, the biggest technological development making airframe maintenance much more efficient is the digital transformation. It enables us to react much quicker to unforeseen events during aircraft layovers, special findings or defects, for example.

"By combining end-to-end data flows through our digital customer interface AVIATAR MRO Management, we were able to implement a digitalised production system that includes aspects such as a transparent work process and additional work approval interface for the customer,



digital job cards or connected tools and automated sourcing processes. In addition to this, we regularly test new technologies and tools, reducing the overall effort for data input and manual tasks for our mechanics,” he added.

Similarly, FL Technics appreciates the digitalisation of processes and procedures, Lapeika said: “Central to our operational framework is the use of an advanced ERP System, a cornerstone that empowers us to conduct comprehensive project analyses with increased accuracy and care.

“Moreover, a strategic investment has been made to maintain an elevated stock level, ensuring a seamless and responsive approach to client requirements. This proactive measure not only enhances operational efficiency, but also underscores our dedication to providing reliable solutions.

“In unison with our commitment to staying at the forefront of industry advancements, our personnel undergo rigorous training programmes, with a particular focus on the latest Airbus or Boeing maintenance methodologies.

“Specifically, our proficiency in mirror fitting repair and pistol fitting repair represents a paradigm shift from conventional practices, removing the need for extensive replacements such as full windshield centre-post framing or full lateral window framing. This strategic adoption of cutting-edge techniques not only serves as a typical example of our commitment to innovation, but also translates into tangible benefits for our clientele, both in terms of cost savings and accelerated project timelines,” he added.

“A cornerstone of our technological capabilities lies in our welding proficiency,

a fact that extends substantial fiscal and temporal advantages to our customers. By leveraging our welding capabilities judiciously, we facilitate efficient repairs that translate into significant cost reductions and expedited turnaround times.”

The major new ‘procedure’ adopted at Premier Aviation in recent times differs somewhat from digitalisation. Tewfik said: “The only thing we did, since we are human-power related, was to start a school inside our walls to help us with the hiring of new employees. As the AME [aircraft maintenance engineer]/ACA [Aircraft Certification Authority] situation is not getting better, we have decided to invest internally.

“We will count on our retention strategies to solidify our future. This is a longer road, but we trust it is the best decision. We currently have a class of

Many A380s are at an age that requires the most comprehensive checks, driving the capacity situation even further

The demand for A380 airframe MRO is "going through the roof", according to the Lufthansa Technik CCO or Aircraft Maintenance Services



20 mechanics (in paid training) who will graduate in ten months."

In the area of preventive maintenance – a growing discipline – metallic materials still dominate the airframe structure, so corrosion remains a threat. Therefore, MRO providers must keep on top of the techniques to prevent corrosion or, if required, repair corroded areas.

New or old techniques, Premier Aviation and FL Technics both follow manufacturers' advice. "We apply all the necessary processes and preventive maintenance suggested by the OEMs," Tewfik said.

Lapeika added: "FL Technics' heavy maintenance facilities meticulously adhere to the procedures outlined by aircraft manufacturers. While we maintain a close working relationship with these manufacturers, it should be noted that our research and development department does not possess the capacity to propose any modifications to maintenance procedures for manufacturers."

Making things last

Jon Morgan of ATS offered a different slant on the task: "The emphasis for

corrosion prevention is not necessarily with new techniques, but with a better awareness of areas susceptible to corrosion and an aggressive Corrosion Inhibiting Compound application programme, which puts better standards to the application of the products on the aircraft," he explained. "Also, the care and storage of aircraft while being parked has been improved by the OEMs' continued airworthiness programmes."

Marcus Motschenbacher agreed that corrosion does indeed remain an issue for the MRO providers: "This is especially so after aircraft have surpassed the first six-year check cycle," he said. "In general, we are often experiencing corrosion on the floor beams, which is caused during operation of the aircraft – for example, from leakages, liquid spills in the cabin, and so on.

"With regard to the hull, we have not developed any specific new corrosion protection techniques. However, for the wet areas, we have developed a repair that protects the structure from corrosion. We use different materials

and have developed an alternative method of applying non-textile flooring.

"We generally use standard manual measures to prevent corrosion, done after the repair to comply strictly with the application of anti-corrosion compounds. To optimise the measurement of thickness after the treatment of wing-skin corrosion, we use non-destructive testing devices that automatically forward measurements and reports to the OEM, with little involvement from our engineering teams.

"Lufthansa Technik is very experienced in repairing and treating fibre structures and has done so on all carbon fibre parts of the aircraft for a long time. This expertise and the available state-of-the-art equipment can now be applied across the entire airframe," Motschenbacher added.

These MRO providers, of course, face stiff competition in the marketplace. Therefore, for aircraft operators and asset owners wanting care for their airframes, there is plenty of choice when it comes to spending that sizeable chunk of the overall maintenance budget. **AJ**



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This image is what heavy-lift helicopters are about: the space onboard to lift sizeable loads internally or slung underneath and deliver that quickly to a ground commander. Sgt Gariépy-Levert, the loadmaster of 450 Tactical Helicopter Squadron, RCAF crouches on the rear ramp of a CH-147F Chinook helicopter flying over the Nicholson Peninsula, Northwest Territories, in September 2023.

Cpl Marc-André Leclerc, Valcartier Imaging Section, Canadian Armed Forces

The military heavy- medium helicopter market

state of flux
or business
as usual?

Paul ‘Foo’ Kennard,
former RAF Chinook
pilot, and MOD
Requirements Manager
and now Director
of Ascalon Defence
Consultancy discusses
the current state of
the military’s heavy
lift helicopter market
– and the significant
changes that have
occurred within it







ABOVE:

Operations in Iraq and Afghanistan secured the heavy lift capabilities of the Chinook within the RAF. Crews were daily taking the aircraft to its limits and occasionally beyond, all of which it met with ease

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OPPOSITE:

The US Marine Corps accepted their first CH-53K in May 2018 during which the aircraft entered the Supportability Test Plan, the type is slated to reach full operational capability in 2029

Sikorsky

The land domain military rotorcraft sector has always been divided into broadly three roles, Scout, Lift, and Attack, delivered by platforms that are either dedicated attack helicopters (AH), light utility helicopters (LUH), medium support helicopters (MSH) or heavy lift machines. Sometimes, a single type can operate across the notional boundaries; for example, Airbus' H145 serves as a LUH (especially when one considers its extensive employment by the US Army as the UH-72A Lakota) and as a light attack platform in H145M guise equipped with the 'H-Force' tailorable sensor/weapons package.

However, setting aside full-time AH, such as the AH-64, AH-1, the Tiger and the LUH types, of which in the UK the Wildcat is the obvious example, increasingly most of the battlefield effort supplied by rotorcraft is via the MSH and heavy

lift categories. Field commanders have other ways of attacking tanks and similar targets in the close battle, including artillery, rocket systems, direct-fire anti-tank missiles and close air support (CAS) fixed-wing aircraft, while the 'find' role is increasingly becoming the preserve of uncrewed air systems (UAS) of all shapes, sizes, and configuration – from a nano-UAS carried in a soldier's backpack to a theatre level commander's asset, in the DoD UAS Group Four and Five classes, operating at height and stand-off range. What cannot yet be reliably delivered by other means is the rapid movement and vertical delivery of men, material and supplies around the battlespace. For this role, save for the enormous risks associated with parachuting or the small-scale use of resupply UAS, the MSH and heavy lift helicopter still have a massive part to play in the planning and executing the near and sometimes deep battle.




borne troops have a significant 'mobility differential' over wheeled or tracked troops and can deliver shock and associated firepower rapidly on the battlefield. Helicopters can also deploy a recce 'screen' to gather timely information. The purest role of the assault helicopter is to achieve that 'talisman of success' – surprise – by delivering combat overmatch in locations and at times where and when the enemy least expects it. This ability to surprise the opposition is one of the many reasons that Western forces employed helicopter assault force (HAF) tactics in the campaigns in both Iraq and Afghanistan and why, as a CH-47 pilot, I sometimes found myself, literally, in the enemy's back yard at 0330hrs in the morning.

Historically, as an article looking at the global helicopter market, this feature would examine and discuss designs and market share from both Western and other suppliers, notably Russia and China. Since the Russian invasion of Ukraine in February 2022, the market has dramatically altered. The demands of the war, plus the associated sanctions imposed by Western nations, have had a significant impact on Russia's ability to export and support its rotorcraft. In some cases, the supply of spare parts has dried up. Many former Warsaw Pact NATO nations have also been encouraged to pass on their legacy Soviet-era weapons to Ukraine; dozens of Mi-8/17s and Mi-24/35s were delivered in the weeks and months after hostilities started. Often, these 'donations' are being backfilled by surplus stocks of Western equipment or, especially in the case of Poland, by new machines being purchased as part of an ambitious (and expensive) rearmament program with more modern equivalents. The Polish

order for 96 AH-64Es, for example, will make them instantly the second largest user of the Apache after the US Army – with almost double the fleet size of the UK's future AH-64E force. Therefore, the 'backfilling' and rearmament of NATO's Eastern flank is having a distorting effect on the global weapons market, and helicopters are not immune to the impact.

Looking at better options

Additionally, many users of Russian equipment are also watching what appears to be some abysmal battlefield performance from hitherto 'staple' helicopters such as the Mi-8/17. However, it must be remembered that Tactics Techniques and Procedures (TTPs), training, currency and platform subsystems significantly contribute to combat effectiveness – and, in some cases, can make up for relatively poor aircraft. Therefore, many countries that have previously attempted to remain non-aligned, often electing to split their purchases between East and West, are starting to look more towards Western-sourced products than Russian.

A recent discussion with some Indian counterparts was instructive; they were, frankly, dismayed at the poor combat prowess on display from Russian equipment, and they suggested that to provide a credible deterrent to their would-be opponents (not named, but inevitably including Pakistan and China) they would need to seek more Western technology. In recent years, India has looked to both France and the US more than Russia, selecting the AH-64 and CH-47 to rebuild their helicopter capability around, and, only last year (shortly after the invasion of Ukraine) and ostensibly to 'buy Indian', the Air Force cancelled a purchase of 48 additional Mi-17s in favour of investing in a new 'Indian Multi-Role' 

Lt Gen Jim Gavin, famed wartime commander of the 82nd Airborne Division and the only General officer to make four combat jumps in World War Two, prophetically described the future roles of the helicopter on the battlefield in an article in Harper's magazine as long ago as 1954 in an article entitled Cavalry, and I don't mean horses.

"Cavalry is supposed to be the arm of mobility. It exists and serves a useful purpose because of its mobility differential – the contrast between its mobility and that of other land forces. Without the differential, it is not cavalry. Cavalry is the arm of shock and firepower; it is the screen of time and information. It denies the enemy that talisman of success – surprise – while it provides our own forces with the means to achieve that very thing, surprise, and with its destruction of the enemy."

'Jumping Jim' Gavin's comments still stack up some 70 years later. Helicopter-



The UK Ministry of Defence announced in May 2023 it had invested £1.4bn to upgrade its Chinook fleet; it will add 14 new H-47 extended range (ER) heavy-lift rotorcraft in an effort to modernise its fleet. With a top speed of 300kph, the H-47(ER) will have a range of new capabilities
UK MOD Crown Copyright



Helicopter’ to be produced locally. The significant legacy Mi-17 fleet in Indian service seems to be suffering as well, with reports suggesting that the aircraft is suffering availability rates of less than 30% due to a crippling lack of spares, especially engines, due to sanctions and Russian needs. The shortages are so acute that India must establish local production lines for reverse-engineered replacement spare parts to keep their Mi-17s viable.

In short, it’s currently a febrile market for Russian-produced aircraft. As such, the rest of these two articles, this part examining the heavy lift options, and Part Two, the more crowded medium lift marketplace, will focus on Western and, to a lesser extent, Chinese output.

In simple terms, the heavy-lift helicopter market is almost fixed for the foreseeable future. Suppose the ‘ultra-heavy’ Mi-26 *Halo* is discounted due to its relatively small numbers (lots of countries or

operators have a handful for specific tasks), questionable spare support, and limited battlefield utility due to its sheer size. In that case, the military heavy lift market is effectively dominated by two US designs, the CH-47 and CH-53 (as the S-64 Skycrane is now solely built and employed in the civil sector).

To be kind, neither are in the first flush of youth. The CH-47 first flew as long ago as 1961, while the CH-53 made its maiden flight (in twin-engined form) in 1964. Of course, while externally, both aircraft still retain broadly the same size and configuration – though the -53 has ‘grown’ a third engine and more rotor blades – under the skin, they are far more modern, having been the beneficiaries of decades of continuous improvement, including extensive ‘digitisation’ in terms of systems and equipment in recent years. The latest production versions of both designs, the CH-47F Block II and the CH-53K King Stallion (Kilo), are

more effective than their 1960s forebears and bring capabilities to the battlefield unimagined when they were both originally designed some six decades ago.

The CH-53K is an impressive helicopter – all the more so by being ‘wet built’ and power folding to suit its primary customer, the US Marine Corps’ needs. Capable of transporting a 16,000kg underslung load (USL) and with a large cabin capable of carrying troops, stretchers or small vehicles, the Kilo is approaching twice the gross weight of a CH-47F – some 40,000kg when carrying a USL, compared to the CH-47F’s 24,500kg in the same role. ‘On the wheels’ is a bit closer; 33,000kg plays 22,700kg, but that’s still a considerable delta in vertical lift terms. To deliver such supreme capability, the Kilo is powered by three 7,500Hp GE T408 engines. Throw in a wholly digital fly-by-wire (FBW) control system, advanced glass cockpit, the



“The global list of Chinook users is long and continues to grow. Germany is just the latest country to sign up to Team Chinook”

provision for air-to-air refuelling and comprehensive weapons, Defensive Aids, and sensors suite, and it's clear that the CH-53K is a competent asset.

Unfortunately, such exquisite capability comes at a 'boutique' price rather than at 'off the peg' rates. The CH-47F Block II can be viewed as a continual evolution from the 1980s vintage CH-47D to the 'F' and now the 'Block II'. The Chinook has been in series production the whole time, with bursts of regression testing required to keep the certification up to date as the base platform has changed. By comparison, the CH-53K is, effectively, an entirely new build aircraft designed to fit into the same space envelope as the legacy CH-53E, and that has brought with it a requirement to complete a full set of design, testing and certification activities. In the case of the Kilo, this almost clean sheet approach has undoubtedly yielded an aircraft of immense capability but has done so at a considerable cost.

Providing an accurate acquisition price for any military item is fraught with risk, and it naturally varies with what's included – and often, both industry and the military deliberately attempt to hide or confuse the cost by sliding aspects in and out of consideration to arrive at a figure to meet their political needs at the time. Want to make the aircraft seem cheaper? Remove design, certification, and operating costs. Need to make a big statement about investment in a location for an election? Pile in all the expenditure lines you can to make the headline figure seem more impressive to voters.

How much?

A key factor is whether the figure being discussed is the unit's 'fly away cost', i.e., what it takes to build and assemble the parts (derived from the Bill of Material (BoM) and labour rates/time), or if the non-recurring

expenditure (NRE) is factored in to provide a broader program cost per airframe. NRE typically includes the design effort, establishment of the production line and then certification flying and clearance activity. The impact on the individual tail number price that including the NRE imposes, logically, reduces over the more airframes that are produced to amortise it over. And, in a nutshell, that's the Kilo's big problem. The aircraft's sponsor, the USMC, only requires circa 200 machines. Data released by the US Government Accounting Office in 2014 suggested a total program cost of US\$25Bn, with an NRE-excluded 'fly away' of \$92m, but when NRE was factored in, this figure spiked to \$124m. A USMC spokesman, speaking in the *Marine Corps Times* in 2022, still told of a unit cost of \$92m per airframe. Still, external experts looking at the increased NRE bill due to delays and problems encountered during

flight testing – several of which have required design changes – now estimate the NRE-included price of the -53K to be nearly \$140m. That is a terrifying number (almost twice the cost of an F-35A) and likely the primary factor in why the -53K is proving a tough sell on the export market. Germany, seen as the most logical export customer given their long association with the CH-53GA, passed on the Kilo (electing to buy a tailored version of the CH-47F instead), and only Israel, thanks it must be assumed to the way their £3.5Bn per year of defence credit in the US is spent, has agreed to buy the aircraft, and then only in modest quantities, with an order lodged for 12 aircraft.

This might prove to be the Kilo's Achilles Heel. Highly optimised towards the USMC mission, many other countries don't need the amphibious capability and the cost, weight, and complexity it brings, nor do they want to be part of a small global fleet size where the primary customer will doubtless have primacy over spares and control the direction and timing of upgrades. From my perspective, I can't see many other export opportunities for the aircraft. The only nation that I can think of with a requirement that might need the CH-53K's amphibious capability and has a large enough budget to afford it is France. The French Navy operate three *Mistral*-class amphibious assault ships, and the -53K may well be a good fit for their embarked air groups in small numbers. However, with Germany opting for Chinook and the stellar reputation UK, Dutch and Canadian Chinooks have acquired supporting French Counter-Terrorism operations in Sub-Saharan Africa, it's potentially more likely that France would follow the example of the joint Franco-German C-130J unit and opt for a small fleet of CH-47s, operated

alongside Germany's, to satisfy their Heavy Lift needs if deemed necessary.

The same criticisms on price and export potential cannot be levelled at Boeing's veteran workhorse, the CH-47.

The legendary Chinook

Although significantly outperformed by the CH-53K, the Chinook has several attributes that give it a clear-cut advantage. First and foremost is cost; the US Army alone operate close to 500 CH/MH-47s, and the current roster of export customers nearly doubles that – with over 1,400 aircraft having been produced since the 1960s (several hundred have also been back through the line for remanufacture to mark numbers later). The line at Ridley Park, Philadelphia, is still turning out the latest MH-47G Block II for the 160th SOAR, CH-47F for export customers and a drip feed of Block II aircraft for the US Army. The long production run of the CH-47F and the modest upgrades now incorporated into Block II have meant that the NRE has both been contained and amortised over a large number of airframes. In 2021, Australia paid US\$260m for four additional CH-47Fs and support equipment via the Foreign Military Sales (FMS) process. That gives a unit cost in the \$50-60m bracket, depending on the nature of the support equipment. You can, therefore, reasonably assume that you can comfortably purchase and operate two Chinooks (the answer to every military problem) for the price of a single CH-53K. A pair of CH-47Fs will lift more than a single Kilo and also be capable of being in two places at once while providing far more robust inbuilt fleet resilience to losses and accidents.

The 'sticker price' isn't the only advantage the Chinook has over the Kilo.





The global list of Chinook users is long and continues to grow. Germany is just the latest country to sign up to Team Chinook and, if the \$8.5Bn funding remains, plans to purchase up to 60 helicopters in a slightly bespoke configuration to meet their specific requirements. India, the UAE, the UK, Egypt, Australia, South Korea, Spain, and The Netherlands have all ordered or received new Chinooks in the past few years, representing the kind of order book a Sikorsky salesman can only dream of. With so many operators, countries buying Chinook for the first time can rely upon support for training, TTP development, upgrades, and reduced cost of ownership due to the availability of spares. They can exchange their crews and engineers to learn best practice before the aircraft even arrive (as an example, when the RCAF bought back into Chinooks during the Afghan War, Canadian personnel were ‘seeded’ into US, UK, and Dutch Chinook units

to accelerate the fielding process) and when the day to deploy comes, almost inevitably will find other Chinook users nearby to swap tools, spares, and knowledge with.

The reason the market comes down to these two heavyweights is due to two main factors.

Future solutions

Firstly, the single most significant global stimulator for rotorcraft technology is the US Army. They have signposted their direction of travel into the future via the Future Vertical Lift (FVL) initiative, which is a suite of projects designed to, over time, recapitalise the US Army’s fleet with a new generation of technologically advanced and high-performing aircraft. Included in the FVL portfolio were/are FVL-Heavy and FVL Ultra, with the former being a CH-47 replacement and the latter straddling the gap somewhat between what a Chinook and C-130J can deliver.

ABOVE:

The Chinook is vulnerable over the battlefield and is fitted with a comprehensive self-defence suite. A CH-147F of 450 Tactical Helicopter Squadron, RCAF conduct live door gunner training to qualify students on the C6 machine gun in the training area of Garrison Petawawa, in February 2023

Cpl Sarah Morley, Canadian Armed Forces

OPPOSITE:

The Israeli order for the CH-53K includes T408-GE-400 engines; facilities study, design, and construction; spare and repair parts; support and test equipment; publications and technical documentation; aircrew and maintenance training; US government and contractor engineering, technical and logistics support services

Sikorsky

An The West's heavy helicopter airlift capability rests on the shoulders of the Boeing Chinook and variants of the Sikorsky's H-53 family. Both types have undergone significant upgrades since they entered service and will no doubt need further in the years to come until a new replacement type comes off the drawing board

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However, outside some seed corn studies (readers may recall artists' impressions of the so-called V-44 Quad Tiltrotor some years ago), the Army has been reluctant to invest meaningfully in the Heavy or Ultra projects. Instead, the Army has preferred to back the Medium and Scout projects, now forging ahead as the Future Long Range Assault Aircraft (FLRAA) and the Future Attack and Reconnaissance Aircraft (FARA). To be blunt, without the US Army funding its development, there will be no replacement for the Chinook, apart from a newer and better Chinook. Perhaps a window into the Army's mid-term thinking was the flight demonstration of a CH-47D fitted with the same T408 engines fitted to the CH-53K. These engines offered a considerable increase in available power (54% more than the current T55-714) – effectively risking an over-torque of the transmission system – but could point the way towards yet more capability being extracted from

the Chinook airframe in the future with some modest upgrades to the platform's components.

Secondly, unlike the crowded MSH market, there is no European challenger in the Heavy Lift sector. While France did build the large Super Frelon (still being made by China, in a developed form, as the civil Avicopter AC313), it was an aircraft more like the Merlin in being a large design with a medium payload rather than an actual Heavy Lift machine. An attempt to develop a genuine European Chinook/CH-53 rival was started in the early 2000s with the Heavy Transport Helicopter (HTH) study, which sought to produce a 30-40,000kg gross weight helicopter to replace Germany's already ageing CH-53GA fleet primarily, and to equip other European users potentially. Unlike the success that European manufacturers and governments had 'persuading' their fellow Europeans to buy the NH-90 in reasonable numbers, this time, the

answer was a firm "No". Those countries with a heavy lift need, except Germany, were already Chinook users (and, in the case of Italy, also a manufacturer), and therefore, the number of likely orders, comfortably less than 200, would have resulted in a commensurately huge NRE amortisation cost, and thus a price per airframe that even the most committed of Europe first believers could not countenance.

With Europe yielding the field and most non-Chinook countries electing to continue to exploit a broad selection of medium types (from small to large), the 'last platforms standing' in the military Heavy Lift sector are the CH-47F and the CH-53K. Nothing looks likely to challenge them for the foreseeable future. **AI**

(In Part Two, *Air International* will look at the far more congested and fluid medium helicopter market, where we are approaching a fundamental change in technology and capabilities.)

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Dubai

Air Show 2023

Debutantes and Belles of the Ball

The 18th edition of the Dubai Air Show featured more than 190 aircraft on static display or flying, as well as 1,400 exhibitors from more than 95 countries.

Jon Lake presents his highlights from this year's show



There was great excitement at the appearance of what were initially thought to be the first pair of Hongdu L-15A Falcon advanced jet training aircraft for the United Arab Emirates Air Force and Air Defence (UAE AF&AD) in Dubai. However, the aircraft, marked as L15 64 and L15 65, were painted in a gloss black colour scheme with bold red and yellow flashes, leading some to speculate that they were destined for the UAE AF&AD's Al Fursan demonstration team.

The aircraft were China National Aero-

Technology Import & Export Corporation (CATIC)-owned demonstrators. They had departed Xinjiang, China, for their ferry flight on November 6, 2023, making a single fuel stop in Pakistan before flying to Dubai's Al Maktoum International Airport.


The L-15 advanced jet trainer debuted at the Dubai Airshow in November 2021. In February 2022, Emirati Defence Ministry spokesman Col. Abdalnaser Al Humeidi announced that the United Arab Emirates had signed a letter of intent to procure 12 L-15As, with a total requirement of 36 aircraft. On February 21, 2023, during the International Defense



Exhibition and Conference (IDEX 2023) in Abu Dhabi, CATIC announced that the UAE had signed an agreement to purchase 24 Hongdu L-15 Falcon (JL-10) advanced trainer jets. However, the number was corrected to 12 (or 15, according to some sources).

On the opening day of the event, the UAE's Tawazun Council, an independent government acquisition entity that works closely with the Ministry of Defence, announced a \$400 million deal "to procure an air show aircraft and its accessories", including support. Colonel Saeed Al-Ghawi from the UAE

Defence Ministry confirmed that a contract had been finalised with CATIC to acquire 12 Hongdu L-15A jet trainers as replacements for the Leonardo/Aermacchi MB-339NATs currently flown by the Al Fursan. However, no delivery date was given, and it is unclear as to whether the team will still be using the MB339 at the next Dubai Air Show in 2025. Options for 36 additional L-15 aircraft remain in place, and conversion of these options into firm orders will depend on the L-15A's performance.

The L-15A variant selected by the UAE uses the non-afterburning Ukrainian 

MAIN IMAGE

The 2023 Dubai Air Show included over 1,400 exhibitors from 95 countries and attracted trade visitors worldwide, exceeding 2021 figures. Emirates ordered 95 additional aircraft for its fleet, which already consists of the Airbus A380, here escorted by Al Fursan (The Knights), UAE's aerobatic display team

Dubai Air Show

INSET

The Dubai Air Show was held under the patronage of Sheikh Mohammed bin Rashid Al Maktoum, the ruler of Dubai, and Vice President and Prime Minister of the UAE

Dubai Air Show/Jeff Holmes



Ivchenko-Progress AI-222-25 engine, which may soon give way to a Chinese-built powerplant since Sino-Ukrainian relations are at a low ebb due to the ongoing conflict in Ukraine.

Colonel Al-Ghawi said that the L-15A had been selected by a committee based on the “best quality and price” and insisted that the team had been closely involved in analysing different aircraft types. The Al Fursan team commander, Colonel Sultan Alkindi, had flown the L-15A twice and was enthusiastic about the type's performance and handling when *Air International* spoke to him at the show. However, other sources close to the team were more sceptical about whether the type's digital fly-by-wire flight control system would be well suited to fly aerobatics in close formation.

Others privately said that the acquisition of the L-15A was driven by a desire to demonstrate that the UAE can always seek diverse sources for its defence equipment in the wake of the collapse of the F-35 deal and that no supplier can take the UAE's custom for granted.

Home team progress

The UAE's Calidus mounted an ambitious display of its products, with two aircraft and two full-scale models in the static display and a B-250 light attack aircraft in the flying display. In addition to the

company's big B-350 COIN aircraft mock-up, Calidus displayed a model of its Sahab unmanned air vehicle (UAV), configured for cloud-seeding. There were also two real aircraft. The first series of production aircraft (c/n 0001, probably serial 982, and possibly designated B-250LA), complete but unpainted, showed off the type's predominantly composite construction. This aircraft is the first of 24 Light Attack variants ordered at the Dubai Air Show in 2019 and will be delivered to the UAE Air Force and Air Defence in March next year. Calidus has structured itself to meet local needs before the international market.

The first Calidus B-250 prototype (980) has been modified to serve as the B-250T basic trainer variant prototype and is painted in a gaudy orange and grey colour scheme. Originally designed as a light attack aircraft for armed ISR and CAS missions, with some advanced training applications, the new B-250T has been developed to meet a new primary trainer requirement. In Dubai, the United Arab Emirates Air Force (UAEAF) announced that a letter of intent had been signed on November 16 for 40 Calidus B-250T aircraft for delivery from mid-2026.

Calidus CEO Khalifa Alblooshi said this was the first contract for the 250T variant, which lacks some of the B-250's mission systems and has a sophisticated

yet user-friendly cockpit with new avionics and a large area display. It also has a distinctive new upward curved wingtip, giving an improved roll rate and handling characteristics tailored to its new role.

The B-250T will also feature a sophisticated ground-based training system and comprehensive emulated radar and sensor capabilities. Test pilot Joao Vilela told *Air International* that the cockpit design philosophy had been fundamental. He praised the aircraft's excellent manoeuvrability and fine flying qualities, which he said were well suited for formation flying. His fellow test pilot Nilson Pirini highlighted the aircraft's avionics flexibility, which he said promises to allow the aircraft to be adapted to meet a wide range of requirements.

The grey-painted second prototype aircraft (981) seems likely to become the prototype for the newly announced WX-80 weather research and cCloud-seeding aircraft. This will feature a podded underwing weather radar and two underwing flare racks, each containing 40 cloud-seeding flares.

Fighter face off

Dubai provided the backdrop for a low-key face-off between India's HAL Tejas light combat aircraft (LCA) and its rival, the Sino-Pakistani CAC/PAC JF-17 Thunder in its latest Block III JF-17C guise.

TOP:
The UAE's acquisition of the L-15 demonstrates its determination to diversify its supplier base, though some believe that operating a type whose other customers are Zambia and Ethiopia “paints the wrong picture”

Jon Lake

RIGHT:
Calidus Test Pilots Joao Vilela and Nilson Pirini in front of the first series production Calidus B-250. Unpainted, the aircraft shows off its composite construction

Jon Lake





LEFT:

The HAL Tejas gave a compelling display in Dubai – though a number of display slots were lost due to minor unserviceability

Jeff Holmes

BOTTOM:

The Block III JF-17C arriving at Dubai's Al Maktoum airport for the air show, laden with three external fuel tanks. The new HUD is apparent

Pakistan Air Force

Neither type is new to Dubai, the Tejas having appeared in 2021 and the JF-17 in Block II form in both 2017 and 2019, but this was the first time both aircraft had appeared at the same show, and DAS 2023 also marked the international debut of the JF-17C.

Group Captain Dinesh 'Danny' Dhankhar, commanding officer of the Indian Air Force's No.18 Squadron 'Flying Bullets', led three Tejas fighters to Dubai – LA-5026, 5027 and 5031 – supported by a C-17A Globemaster III. The squadron is based at Sullur in Tamil Nadu as part of Southern Air Command's No.43 Wing. Dhankhar said the aircraft had flown directly from India to Al Maktoum International Airport without air-to-air refuelling. The aircraft did not fly directly from Sullur to Dubai, a distance of 2,800 km or about double the maximum range of a Tejas with three drop tanks.

The Tejas did not display on November 15 due to a serviceability issue and they aborted a display soon after taking off the next day, but those lucky enough to see the aircraft flying on the Monday and Tuesday of the show were treated to an excellent demonstration of their performance and agility by Group Captain Kartikeya Singh.

HAL built two technology demonstrators, five prototypes and seven limited series production aircraft, plus three Naval LCA prototypes, before producing an IOC batch of aircraft for No.45 Squadron, which formed in 2016, and 15 FOC aircraft for No.18 Squadron, which received its first one in May 2020. A further FOC aircraft is being used as the Mk 1A prototype.

The FOC Tejas Mk 1 aircraft are BVRAAM capable, with an expanded flight envelope including higher angles of attack and g-limits, as well as updated avionics and flight control software, and are fitted with air-to-air refuelling probes. There will also be eight Mk 1 two-seaters, bringing the total to 40. HAL is now also producing 180 Mk 1A aircraft. The Tejas are currently being promoted to Egypt, having failed to win orders from Argentina and Malaysia.

Though the Sino-Pakistani Chengdu Aircraft Corporation/Pakistan Aeronautical Complex JF-17 Thunder was displayed in Dubai in 2017 and 2019, this year's show was the first time the new JF17C Block III variant had been shown. The Pakistan Air Force dispatched three aircraft to Dubai: two Block II aircraft for the flying display – 16-217 from No.14 Squadron 'Tail Choppers', part of No.34 (Tactical Attack) Wing at Rafiqui, and 16-218 from No.16 Squadron 'Black Panthers', part of No.33 (Tactical Attack) Wing at Minhas/Kamra – and a single Block III aircraft – 22-308 from No.16 Squadron – in the static aircraft park.

The Block III JF-17C aircraft can be identified by its stealthier engine air intakes, incorporating diverterless supersonic inlet (DSI) 'bumps'. These replace conventional moveable intake ramps, acting as a compression surface and creating a pressure distribution that prevents most of the boundary layer air from entering the inlet at supersonic speeds. The aircraft also incorporates a new, frameless, wide-angle diffractive head-up display and a host of new antennas and fairings. The aircraft's intakes in the static display were kept blanked and the new HUD was covered. Somewhat less obviously, the JF-17C is fitted with a liquid-cooled X-band KLJ-7A AESA fire control radar, a homegrown Link-17 datalink and there

is provision for a helmet-mounted sight to allow an expanded firing envelope for IR-homing AAMs.

The JF-17 was initially designed and developed to meet a Pakistani requirement for an affordable, lightweight multi-role fighter to replace large numbers of Dassault Mirage III/5s, Chengdu F-7P/PGs and Nanchang A-5Cs. To ensure that the aircraft would not be subject to sanctions, the type was co-developed with China for local manufacture and assembly. Some 58% of the JF-17 airframe, including the forward fuselage, wings and vertical stabiliser, is produced in Pakistan, with the remainder in China. Final assembly and serial production are undertaken in Pakistan.

Drawing on the earlier Super Seven project, the JF-17 is a derivative of the older Chengdu J-7, albeit a much improved version, with many systems taken or adapted from the Chengdu J-10. The first of six prototypes made its maiden flight at Wenjiang Airport, Chengdu, in late August 2003, before production began in Pakistan. The PAF received 50 Block I JF-17A aircraft and 59 Block IIs. There are also 26 two-seat Block II JF-17Bs, the first four built at Chengdu and the remaining 22 at Kamra. There were two Chinese-built JF-17C prototypes, the first flying in December 2019, and production is underway, ➔





Dassault Rafale. It will be interesting to see how the aircraft perform in service and on the export market.

Air dominance in Dubai

Apart from the Tejas and JF-17, fighters were much in evidence at Dubai. Emirati F-16E/Fs and Mirage 2000-9s gave dazzling solo displays and participated in the opening flypasts, which showed that the latter now have sniper advanced targeting pods integrated. Although the UAE AF & AD's immediate fighter needs are being addressed with Rafales replacing the nation's ageing Mirage 2000-9s, there is a longer-term requirement to find a successor to the F-16E/F Desert Falcon. At the same time, other regional air forces have outstanding requirements to strengthen their fighter arms. Therefore, it was no surprise that the Lockheed Martin F-35A was displayed at the show, nor that other runners and riders appeared.

Dassault was reluctant to answer questions about the recently submitted offer for 54 Rafales to Saudi Arabia or the the programme to supply 80 F4 standard aircraft to the UAE. Still, the aircraft in the static display was shown alongside locally produced Al Tariq weapons. EDGE subsidiary Al Tariq was a little more forthcoming, with CEO Theunis Botha saying: "The entire family of Al Tariq guided weapons is being integrated onto the UAE Rafale fleet. We are discussing this integration with the team and contracts are already in place. The first Rafale aircraft will be delivered around 2027 and we will be ready to complete the integration by that time."

There was a trio of Eurofighter Typhoons in the static park – two from the RAF's No.11 Squadron, temporarily deployed to Tamim Air Base in Qatar, and one from the Kuwait Air Force. None flew in the display and surprisingly little comment' was made about the Kuwaiti aircraft, which thanks to its Leonardo

with 50 on order for Pakistan. Eight Block IIIs were delivered to Pakistan's Flight Test Centre in early 2022 before the first were delivered to No.16 Squadron at Suler in March 2023.

The JF-17 is the workhorse of the PAF fighter force, augmenting the Lockheed Martin F-16 Fighting Falcon at approximately half the cost and equipping seven fighter squadrons based at five air bases. The aircraft was also always intended to have export potential and has been offered as a cost-effective alternative to more expensive Western fighters. So far, 16 JF-17Ms (two of them two-seaters) have been ordered by Myanmar and three JF-17Ns by Nigeria. However, problems have plagued the Myanmar contract, with the aircraft being grounded while structural cracking was addressed.

It would be easy to conclude that the JF-17 and the Tejas were broadly comparable. A simple comparison of dimensions, weights and performance parameters makes the two aircraft seem more similar than they are. Quite apart from the qualitative difference between the Tejas's US-built General Electric F404-GE-IN20 engine and the JF-17's Klimov

RD-93MA, the Elta EL/M-2032 radar in the Tejas is likely to outperform the JF-17C's NRIET/CETC KLJ-7A, even though the latter uses an active electronically scanned array (AESA), which the Tejas will not have until the Mk 1A version enters service.

Though the Tejas has suffered its share of problems and difficulties, the locally developed FBW flight control system has proved revelatory. Developed by an LCA National Control Law (CLAW) team set up by the National Aeronautics Laboratory, the system was tested on the F-16 variable inflight stability test aircraft (VISTA) before Indian nuclear testing led to a US withdrawal from the project, leaving India to complete development alone. This system is responsible for the Tejas's flying qualities, representing its greatest advantage over the JF-17.

While a PAF JF-17C pilot who spoke to *Air International* was extremely enthusiastic about the aircraft and its AESA radar, his point of comparison was the F-7PG he had flown previously. Indian pilots rate the Tejas mission system and MMI favourably, even compared to the

TOP:
Dubai marked the first public appearance of the Block III JF-17C. The aircraft is still in service only in small numbers and No.16 Squadron was the first operator
Jon Lake

RIGHT:
Though no one was making much of a fuss about it, the Kuwaiti Typhoon was probably the most advanced and capable fighter on show in Dubai, thanks to its leading-edge ECRS.Mk 0 radar and state-of-the-art repositioner
Jon Lake





ECRS.Mk 0 AESA radar probably represented the most advanced fighter at the show.

Ironically, the fighter attracting the most interest was a derivative of the oldest design at the show: Boeing's F-15QA Ababil or Advanced Eagle. Though it looks similar to any two-seat Eagle, the F-15QA is very much a version for the 21st Century, with advanced sensors, avionics, cockpit and flight control system. The Advanced Eagle evolved from the F-15K SLAM Eagle and the F-15SG for Singapore and the F-15SA Advanced Eagle for Saudi Arabia was the first variant with the new FBW flight control system and BAE Systems AN/ALQ-250 EPAWSS, while the F-15QA for Qatar introduced a large area display in the cockpit and the AN/APG-82(V)1 AESA radar.

Boeing borrowed a pair of F-15QAs – QA501 and QA520 – from the Qatar Emiri Air Force and used them as stand-ins for the new F-15EX Eagle II, which is currently undergoing development and operational testing and evaluation for the USAF and is the basis of Boeing's current export offering. The F-15EX is being offered as both a newly built aircraft and as an upgrade configuration, principally

targeting existing Eagle customers.

Indonesia has signed a non-binding memorandum of understanding for 24 F-15EXs, while Poland is reportedly discussing a potential order for 32 aircraft. Israel has also formally requested 25 F-15EX fighters, although foreign military sales of the F-15EX are currently understood to be on hold due to the ongoing Gaza conflict.

One of the F-15QAs provided a highlight of the daily flying display, flown by Boeing test pilot Jason 'Mongoose' Dotter with flight test engineer Mike 'Houdini' Quintini in the back seat. Displayed clean, at low weight and powered by General Electric F110-GE-129 engines, the F-15QA was always going to be an impressive performer, but the Advanced Eagle's FBW flight control system seems to have further improved its agility and handling characteristics.

Weapons

The UAE has a large and rapidly growing defence sector, dominated by the Emirati weapons conglomerate EDGE, whose component companies produce a wide range of air-launched weapons and unmanned systems. Halcon, for example,

has precision-guided munitions, short-range air defence systems and loitering munitions, while Al Tariq specialises in kits that convert unguided weapons into long-range, high-precision munitions.

This year's show was marked by a series of announcements about agreements to integrate indigenous weapons on a succession of platforms, notably Halcon's Desert Sting and Thunder on the Calidus B-250, and Al Tariq-S and long-range Al-Tariq-LR missiles on the Rafale and Tejas. General Atomics Aeronautical Systems Inc (GA-ASI) announced an agreement with EDGE to integrate smart weapons onto the MQ-9B SkyGuardian remotely-piloted aircraft, which the UAE hopes to acquire.

The UAE's acquisition of 80 Dassault Rafales has led to a rush for co-operative programmes with the Emirates, including plans by MBDA to push ahead with the joint development of a range of missiles with the UAE. In pursuit of this, MBDA has opened a new 400m² Missile Engineering Centre in Abu Dhabi. The company is also in intensive talks with EDGE, hoping to leverage the local giant's capabilities and supply chain.

The Missile Engineering Centre



TOP:

The noisiest and tightest display was given by the F-15QA Ababil, flown by Boeing test pilot Jason 'Mongoose' Dotter with flight test engineer Mike 'Houdini' Quintini in the back seat

Jeff Holmes

LEFT:

Patrice Hajjar, MBDA's Vice President Middle East, highlighted the company's ongoing work in the UAE, especially on the Smart Cruiser, a swarming effector that will "saturate and disrupt enemy air defences"

Jon Lake



is working on the 'pre-development' of a family of smart weapons, with an initial focus on the Smart Cruiser, a next-generation, highly-connected, AI-embedded cruise missile that will equip both French and Emirati Dassault Rafale fighter-bombers, which was initially seen as being one of the key effectors for the Franco-German-Spanish FCAS sixth-generation combat air system-of-systems. The weapon is similar in size and configuration to the MBDA Smart Glider but is powered by a Microturbo jet engine. It will be equipped with a data link, allowing it to be fully integrated

into the Orchestra combat cloud. The missile features an infrared imaging seeker with semi-active laser capabilities when required. It will provide what Patrice Hajjar, MBDA's vice president for the Middle East, described as "a swarm effect to saturate and disrupt enemy air defences", using the higher manoeuvrability provided by the engine and the data link to facilitate co-ordinated, manoeuvring, swarming attacks. Artificial Intelligence algorithms will probably be added in a subsequent spiral evolution of the system.

One notable absentee from the show

was Israel, whose IAI and Rafael had large exhibition stands that were left empty and unmanned, presumably in light of the ongoing conflict in Gaza. Russia was absent from the main exhibition hall, but was present at the show. The UAE has not imposed sanctions on Russia over the invasion of Ukraine, but Russian participation was limited to a pavilion at the far end of the outdoor exhibition area, where a Kamov Ka-52E attack helicopter and an Ilyushin Il-76MD-90AE military transport aircraft were on static display. The Russian Knights aerobatic display team also mounted a performance.

TOP:

Leonardo brought a new Guardia di Finanza AW169 to Dubai to find parapublic customers for the type in the UAE and the wider Gulf region

Leonardo

RIGHT:

Airbus estimates an international market for 300-400 LAH versions to replace legacy attack helicopters, including significant numbers in the Middle East. The aircraft is based on the airframe of the Dauphin

Jon Lake



Rotary highlights

The Dubai static display is always crowded with helicopters, with local parapublic operators and the UAE's Joint Aviation Command displaying a range of rotary wing aircraft alongside commercial operators and flying schools. This year, futuristic eVTOL flying taxi designs were also presented in mock-up form.

The Leonardo Agusta Westland AW169 is no stranger to the UAE. Local operator Falcon Aviation Services flies the type for VIP and offshore services. Abu Dhabi Aviation is also an enthusiastic operator, while the Dubai Police have five on order. However, this year's show saw the debut of Leonardo's skid-equipped AW169 sub-variant.

Following the success of the skid-equipped AW109 Trekker launched at HAI Heli-Expo 2014 and certified in 2017, a similar modification to the AW169 was perhaps inevitable, especially after the AW169M (Multiruolo, Multirole) Italian Guardia di Finanza ordered UH-169A, and the militarised AW169MA (multiruolo

Leonardo borrowed an Italian Guardia di Finanza AW169 helicopter for static display in Dubai and to undertake a brief demonstration tour following the show, hoping to generate interest among local law enforcement, search-and-rescue services and offshore transport operators. This aircraft is fitted with the new skid landing gear and features a comprehensive SAR/public security configuration with several proprietary technologies in integrated sensors and mission equipment. The aircraft also incorporates newly certified dedicated SAR (search and rescue) modes.

Leonardo has been active in the UAE for more than 50 years, and the region represents one of its largest and most important export markets across a range of domains. More than 100 Leonardo helicopters are used in the UAE for VIP and military utility transport, oil and gas support, search and rescue and security. Leonardo and its local partner, Abu Dhabi Aviation, operate a major support centre here. The AW139 is a regional favourite

firefighting derivatives. The KUH-1E export variant was unveiled in 2019. Compared with the original Surion, it featured Garmin G5000 avionics and a TCAS II collision avoidance system and nose-mounted weather radar, along with a strengthened structure to carry external fuel tanks and weapons pylons. The company also offers an optional VIP passenger interior. The example at Dubai was displayed alongside a weapons package including stub wings carrying a range of armaments and a three-barrelled cannon designed to be mounted under the nose.

At the show, Korea Aerospace Industries' representative Cho Seok Joon had revealed that the UAE had entered advanced negotiations to buy an undisclosed number of KUH-1Es and the acquisition was expected to conclude before the end of 2023. The UAE is seeking a maritime variant of the KUH-1E to enhance its surveillance and response capabilities.

The second Korean helicopter type making its international air show debut



LEFT

The Super Puma parentage of the LUH-1E is unmistakable, though there are many differences. KAI is energetically marketing a 'Maritime LUH' variant to the UAE. This would be fitted with a nose-mounted radar and IR/EO turret and armed with Tawazun Logir and Alheda missiles

Jon Lake

avanzato; multi-role advanced). Orders were placed for the UH169 LUH by the Italian Army and Austrian Army.

Since the certification of the skid-equipped aircraft in 2022, Leonardo has unveiled an increased gross weight (IGW) kit, giving a 300kg increase in maximum take-off weight from 4.8 to 5.1 tonnes and a new 11-passenger configuration for military and oil and gas operations. The new configuration features a redesigned modular fuel tank system, reducing range by about 60nm, and adds two additional Type IV emergency exits in the cabin. The certification of the IGW increase is expected in 2024, while the 11-seater configuration with a new modular fuel tank should be certified in 2026. With these enhancements, the rotorcraft matches the capabilities of larger legacy types such as the Airbus Helicopters AS365/H155 Dauphin and the Bell 212/412.

and is in service in large numbers, and Leonardo hopes that the newer AW169 will repeat its sibling's success.

Two Korean helicopters made their international air show debut in Dubai this year, derived from Aerospatiale/Airbus Helicopters designs. The KAI KUH-1E utility helicopter is an export derivative of the KUH-1 Surion, used as an assault/utility transport by the Republic of Korea Army (RoKA). The RoKA achieved a significant milestone on November 2, 2023, taking delivery of its 200th KUH-1 Surion, and some 250 aircraft have been delivered to date.

The Surion is based on the design of the Airbus Helicopters AS332 Super Puma and has served as the basis of the MUH-1 Marineon amphibious assault helicopter variant for the Republic of Korea Marine Corps and medical evacuation, law enforcement, anti-submarine warfare, coast guard and

was the KAI light attack helicopter (LAH) based on the H155 Dauphin and powered by Hanwha-built Safran Arriel 2L2 turboshaft engines. In 2015, Airbus Helicopters and KAI announced an agreement to transfer manufacturing of what was then known as the EC155 to South Korea, with KAI becoming the sole manufacturer of the type after 2018. Both firms were to be involved in marketing and further development of the type. KAI has developed two derivatives of the Dauphin, starting with the light civil helicopter (LCH), which first flew in France on July 24, 2018. The armed LAH followed one year later, making its maiden flight on July 4, 2019. The LAH offers robust attack capabilities, including anti-tank systems, together with the ability to carry missile reloads or a small number of troops, a similar concept to the Mil Mi-24 Hind. Still in the development phase, the



BELOW:
Mark Kobusson, Managing Director of SC&T Programs in L3 Harris' ISR Sector, explained why the CAEW solutions offered to NATO and Korea are based on the Global 6500 rather than the Gulfstream 550, unlike the CAEW aircraft delivered to Israel, Italy and Singapore
 Jon Lake



LAH is expected to enter service with the Korean armed forces at the end of 2024, replacing the MD Helicopters MD 500 Defender and the Bell AH-1J/S Cobra. Airbus predicted an eventual demand for 100 LCHs and 214 LAHs within South Korea.

Korea's Defence Acquisition Programme Administration awarded a contract to KAI in December 2022 to supply an initial batch of ten LAH helicopters to the Republic of Korea Army. Follow-up orders are expected to continue into the next decade. To this end, Airbus Helicopters and KAI have

signed an agreement to initiate the serial production phase of the LAH, ramping up production of the LAH at KAI's Sacheon facility in South Korea, with Airbus Helicopters delivering the kits required for mass production.

In September 2022, KAI announced that an LUH derivative is under development, which will focus on the helicopter's troop-carrying capabilities, particularly special forces. Jung Moo Yang, senior manager of KAI's rotorcraft business team, said there is significant interest in the LAH in the Middle East. At the same time, Airbus has estimated

an international market of 300–400 LAH versions to replace legacy attack helicopters.

Airborne early warning and control

As has become usual for the Dubai Air Show, the UAE AF & AD showed off one of its Saab GlobalEyes in the aircraft static park and another formed part of the flypasts that opened the show. Saab exhibited a GlobalEye model on its stand and may have hoped to announce that the UAE's fifth and final aircraft had flown, but this didn't happen until November 23, barely a week after the show. There remain several potential GlobalEye customers in the MENA region, especially within the GCC, where few of the members have any airborne radar surveillance capability.

As delivered to the UAE and selected by Sweden, the GlobalEye is more than merely an AEW&C aircraft. Officially known as the Swing-role Surveillance System, the Emirati GlobalEyes carry an under-fuselage electro-optical/infrared sensor turret and a Leonardo Seaspray 7500 radar, giving enhanced maritime and surface search capabilities and making the aircraft a formidable ISR platform. Some customers do not need this kind of dual role versatility, but do want a 360° radar field of regard that the standard GlobalEye does not provide. One such buyer is the Republic of Korea, which requires additional AEW aircraft to bolster its fleet of four Boeing 737 AEW&C aircraft, which are reportedly insufficient to guarantee the ability to sustain a single orbit 24/7. Rather than buying more Wedgetails,



LEFT & BELOW MIDDLE:

The UAE Air Force and Air Defence showed a GlobalEye on the ground and (fleeting) in the air. Saab flew the fifth and final Emirati GlobalEye just a week after the show finished Dubai Air Show

Jon Lake



as the WatchEye system, though the name is unofficial. A similar configuration is understood to have formed the basis of Saab's pitch to meet a NATO AEW requirement, described elsewhere in this issue of *Air International*.

The Korean requirement has attracted a number of bidders, including L3, whose proposal was shown in model form on the company's stand in Dubai. Based on the sensor and mission systems of the IAI/Elta conformal airborne early warning (CAEW) aircraft delivered to Israel, Italy and Singapore, the new L3 solution sees these systems cross-decked onto a Bombardier Global 6500 airframe. The choice of platform was driven, in part, by the fact that the original Gulfstream G550 is no longer in production, according to Mark Kobusson, managing director of SC&T Programs in L3 Harris' ISR Sector. The company is offering similar solutions to several European and Asian customers, having offered a similar Global 6500-based CAEW platform to meet NATO's requirements. **AI**

Korea has mounted an open competition for a new replacement amid reports of dissatisfaction with the existing aircraft. Saab is known to have offered a new variant of the GlobalEye to meet the Korean requirement, with the usual IR/EO sensor turret and Seaspray radar omitted and with two X-band AESA radars — one facing forward from a belly radome, the other facing aft in an extended and enlarged tailcone — augmenting the S-band Erieye ER radar in the dorsal ski-box fairing to provide a 360° field of regard. This new sensor package has been referred to internally



Tom Batchelor
spoke with Cranfield
Aerospace Solutions'
CEO Paul Hutton
about commercial
aviation reaching its
net zero target... and
the developments
that may well see it
achieved by 2026



Innow

The decision by Cranfield Aerospace Solutions (CAeS) to convert a Britten-Norman Islander to a 240kW hydrogen fuel-cell propulsion system (HFCPS) breathed new life into a workhorse within the sub-regional market that has been putting its STOL capabilities to the test connecting remote communities since the 1960s.

Under Project Fresson, CAeS is progressing with plans to begin testing the zero-emissions passenger aircraft in 2024 before the planned entry into service in 2026. Paul Hutton has been at the helm of CAeS since 2015, guiding it through a rebrand in 2016 and securing a £9m grant in 2019 from the UK government through the Aerospace Technology Institute (ATI) programme, kick-starting the Islander conversion.

Amid a flurry of recent developments, including new commercial tie-ups and a renovated research and development facility, Hutton sat down with *Air International* to discuss the Islander initiative and his vision for sustainable regional aviation.

"We're taking a very different approach to other hydrogen demonstrators," said Hutton from his office on the Cranfield University campus. "We will very quickly become the world's experts in hydrogen fuel cell-propelled aeroplanes because we will likely be the first or one of a very small number doing it. Whilst the big companies are working on the larger aeroplanes that will be there in 2035-plus, these Islanders will be flying for many years before that."

Having already carried out baseline flight tests of G-HYUK, the unmodified Islander that will be used as the demonstrator aircraft, in 2024, Cranfield Aerospace will


use the aircraft as a flying testbed for its HFCPS. The demonstrator aircraft will be converted by replacing one of its two-piston engines with the HFCPS, which will generate 240kW of electrical power and produce up to 220kW from the motor. The production version will mount the hydrogen tanks externally on the underside of the aircraft's wing.

Utilising a reliable classic

The converted Islander will have the capacity for six to eight passengers and will carry out missions such as connecting remote communities, commuting and tourist flights. It can also be configured for cargo purposes. With a 60-minute flight endurance plus a 45-minute reserve, the hydrogen Islander has a 200km range plus reserve.

The timeline is for test flights to begin within the next 12 months. This has slipped back from an earlier scheduled date of September 2022, but Hutton said his team members were still hopeful they could make up some time, subject to progress in the hangar: "Our current plan is by the end of 2024. We are looking at an alternative plan to see if we can bring that forward."

The test aircraft will have one wing fitted with conventional propulsion technology to satisfy the safety case; the hydrogen demonstrator technology will be fitted to the other wing. "The new technology will have 110 per cent of the power of the engine it replaces. That extra ten per cent is to compensate for the extra drag of the system that we are putting on board.

"But the key thing is, it's got more than 100 per cent of the power of the engine it replaces, which means we have managed to design something where the wing will take the weight of a system that produces 110 per cent of the power." 

Paul Hutton, CEO of Cranfield Aerospace Solutions, is determined to make commercial aviation cleaner in the future

All images CAeS unless stated

ation | with an **Islander**

CLOCKWISE FROM RIGHT:

The company's CAA Design Approval stretches all the way back to 1948, and the start of the Cranfield College of Aeronautics

The newly refurbished hangar and R&D facility within the Cranfield University campus was opened in July 2023

Becky Kerr photography.co.uk

Evolito joined Project Fresson as a motor and inverter supplier. Based in Oxfordshire, Evolito is the aerospace spin out of YASA – the world-leading pioneer of automotive axial-flux electric motors



Crucial to the design is the packaging of not only the electric motor, but the whole fuel cell system into the volume of the existing nacelle, all while producing 110 per cent of the power. Hutton said this approach set CAeS on a different path to competitor hydrogen demonstrators, which have left the fuel cell system in the fuselage or had developed powerplants that were not producing 100 per cent of the power of the engine they replaced. He said: "Our demonstrator is taking longer because we've spent the time to solve the most challenging aspects of integrating hydrogen fuel cell technology into an aircraft – it's not just a demonstrator; it's en route to a product. We're aircraft people, so we knew it would be hard."

In July, CAeS unveiled a refurbished hangar within the Cranfield University campus, where it is conducting research and development work. The renovation has turned a "crumbling" 1940s, World War Two-era hangar, which was "cold in the winter and hot in the summer", into a modern, well-insulated workspace that Hutton said was a "much better environment" in which the Project Fresson engineers can work.

CAeS uses the hangar for two purposes: maintenance and assembly. The company has Part 145 Maintenance Organisation

Approval, allowing it to deliver comprehensive aircraft maintenance, repair and overhaul (MRO) services. "That Part 145 capability is important because as we develop the technology to go into the zero-emissions technology, we've got to develop the maintenance processes that go with it." CAeS will write the maintenance processes for customers and other MRO facilities to follow and is exploring how best to monetise that through either a form of licensing of the maintenance function or performing some of the MRO services themselves. In parallel, CAeS has a Part 21G capability, which enables the company to manufacture aircraft parts and appliances.

"We can do the assembly in the hangar, but the workshop alongside it would need more space and more facilities. We're looking around the local area for the short term to meet that Part-21 subpart G manufacturing need," said Hutton.

Keeping it real

Both the maintenance and assembly lines are focused on producing a viable aircraft that will meet customer and regulatory approval. CAeS will soon start to strip the airframe down before work can begin installing the new technology as parts start arriving.

Key to the success of Project Fresson is its thermal management system. A hydrogen fuel cell system produces about the same heat as a conventional engine for its power. The difference is that a conventional engine loses most of its heat through its exhaust. Still, there is no exhaust on a hydrogen fuel cell system, so the challenge for the CAeS engineers is to scavenge that heat out while avoiding a massive drag penalty.

"We have to deal with the heat that system produces within the confined space of that nacelle. If we had used a conventional modern aircraft radiator, it would have been two square metres. That's an air brake – it wouldn't have

taken off,” explained Hutton. “There is no use producing a demonstrator where you’re not doing all the power, with all the heat, in a real aeroplane. By designing for the Islander, we could see that [conventional thermal management systems] would not work.”

That is where Reaction Engines stepped in. In 2021, the Oxfordshire and Colorado-based technology company joined the project, bringing expertise gained through developing revolutionary thermal management technology on the Synergetic Air-Breathing Rocket Engine (SABRE) programme (which encompasses both conventional jet and rocket engine technology). Reaction Engines is developing a bespoke ultra-low drag heat rejection system to meet the project’s fuel cell cooling requirements.

Commenting on Reaction Engine’s Sabre technology, Hutton said: “It will be the next technology leap for space access; it is much cheaper to get a spacecraft into space if you haven’t got to carry all the oxygen within the fuel, but it will be a long time before that gets there. If you narrow down what makes their engine work, they can take about 1,000 degrees of temperature out of the air in a few hundredths of a second without imposing huge drag. When you apply it to a 1960s aeroplane that needs to get rid of a lot of heat with low drag – wow, it works.”

CAeS has also partnered with UK technology innovator Evolito, which will

supply axial-flux motors that are smaller, lighter and around four times more power-dense than radial-flux alternatives. The technology also requires up to 75 per cent less iron, less copper and fewer permanent magnets than competing radial solutions, making it lighter and more environmentally friendly.

That commercial sweet spot

If this 21st-century hydrogen project is relying on state-of-the-art technology designed with future spacecraft in mind, why then is an aircraft first designed and built more than 50 years ago the right choice? Hutton said: “There are several reasons why we chose the Islander. For anything larger than sub-regional nine-to-19 seaters, either the technology is not mature enough or just not energy-dense enough yet.

“Anything beyond regional is just too competitive with Boeing and Airbus; clearly, we will not produce an aeroplane to challenge those guys. Anything below nine seats, the technology is up to it, but there’s just not a big enough market for two-seat and four-seat aeroplanes and the development costs are high. Nine-to-19 seats are the right sweet spot.”

Within the sub-regional category, a nine-seater was a “no-brainer” for Hutton. “Why would you try for 19 seats? That makes it riskier,” he said. Notably, the Islander has been proving itself as a versatile short-hop aircraft in challenging global markets for decades. That brings performance data from which

“We will very quickly become the world’s experts in hydrogen fuel cell-propelled aeroplanes because we will likely be the first or one of a very small number doing it”

Paul Hutton, CEO,
Cranfield Aerospace Solutions



CLOCKWISE FROM RIGHT:

Project Fresson is an initiative set to deliver a passenger-carrying aircraft using hydrogen fuel cell technology

Built specifically for cargo, unlike other aircraft, the Black Swan can carry the same load as a small cargo van at a distance of up to 2,500km, resulting in cost, time, and carbon emission savings

CAeS and Dronamics signed an MoU to further progress the application of the HFCS to the Black Swan cargo drone aircraft

CAeS can base any calculations. The benchmark endurance for the hydrogen aircraft is 60 minutes, plus 45 minutes reserve. Hutton and his team arrived at the figure after studying how the Islander currently operates. Around 85 per cent of its flights today are 60 minutes or shorter, even though it can fly for more than four hours.

Another characteristic of the Islander key to Hutton's determination that the aircraft offered the greatest chance of success is its conventional tube and wing anatomy: "When you've got immature technologies, the last thing you want to do with them is take off vertically; it makes your life much harder. An aeroplane with wings has much more chance of getting in and staying in the air. So, that filtered out the eVTOLs [electric vertical take-off and landing aircraft], you can probably get [eVTOLs] flying, you can probably get them certified, you won't produce a commercially viable aircraft because they cost much, much more than an Uber, and you're now competing with Ubers.

"If it's the helicopter market you're competing with, why is it bigger than the helicopter market? Why are more people going to fly just because it is electric? I'm not saying that suddenly Heathrow and Gatwick will be replaced with lots of small airfields. Still, I think the proportion of flights that end up being short-hop will increase, and eVTOLs will not do them; they'll be done by low-cost, zero-emissions aeroplanes that use a small runway and their wings to get into the air."

Hutton opted for a hydrogen propulsion system over a battery or hybrid for reasons including technology maturity, weight and performance: "We are not technology evangelists; we're an aircraft company. When we looked at the Islander conversion, we didn't say, 'What's the right aeroplane for hydrogen?' we said, 'What's the right aeroplane for a green solution?'. With the Islander, we looked at a battery solution, hybrid electric, and then at hydrogen. When we looked at batteries, we found the maximum we could get was a 22-minute flight. In the real world, when you are quoted energy densities of 260kW per kilogram, this is for new battery packs. But the regulator only cares about the energy density when you retire the battery pack. That's a Catch22 situation because the longer you use it, the less energy density it has; the less you use it, the quicker the change out time, and the more money you've got to spend on it. So, batteries and high utilisation in aeroplanes don't work."

Concerning the hybrid model, he said: "With a hybrid, you need a level of redundancy and resilience – the only way we could do that compared to the battery solution was to use a smaller battery pack and have two small, very fuel-efficient engines, whether they're turbines or conventional engines. But when you've added up all the weight of the smaller but still heavy battery pack and the two small, efficient, but still heavy engines, we were producing the same CO2 or worse than the aeroplane that we were replacing.





"It is the worst of both worlds, because when you're flying on the battery, you carry two engines you don't need. When you're flying on these two very modern, efficient engines, you're carrying around a hefty battery pack. When we did the sums, we worked out that the only reason we were getting any benefit was that the two modern engines were a lot more fuel-efficient than the old engine. Let's say you could squeeze everything, and you're getting a ten per cent CO2 reduction. Will somebody invest in an aeroplane that they will keep for 20-plus years to get a ten per cent CO2 reduction and spend £2-3 million for it? They're not going to do that. Hydrogen gives you zero emissions, and if you're flying a fuel cell aeroplane below 10,000ft, there are no NOx or contrails. It's the only solution that works."

Turn on the gas

The next decision was to opt for hydrogen in its liquid or gaseous state. Gaseous hydrogen is carried in heavy on-board tanks, limiting the fuel that can be taken aloft. For liquid hydrogen, the challenge comes because the technology is still immature. Hutton said: "Most important for us when we launch in 2026 in all those little airports

where the Islander is and could be used is the ability to guarantee the availability of liquid hydrogen fuel at minus 260°C. That is unlikely." Gaseous hydrogen in its most inelegant form can come in bottles on the back of a truck, so any small airfield that gets truck deliveries can access its fuel. The most efficient



“Key to the success of Project Fresson is its thermal management system. A hydrogen fuel cell system produces about the same heat as a conventional engine for its power”

way of producing it is to use a shipping container-sized electrolyser located at the airport and plugged into a green electricity source to make fuel on-site. The Islander flies in coastal areas, which typically have an abundance of clean wind and hydroelectricity. “For many, many reasons, the Islander, powered by gaseous hydrogen, is the right aeroplane for us to start with.”

Hutton believes the zero-emissions aircraft will have operational costs up to 40 per cent lower than kerosene-powered alternatives. That calculation assumes hydrogen at £4 a kilogram by 2026 and £2.50 a kilogram by 2030. Those figures could be reduced further, especially with government support putting downward pressure on the price of hydrogen. Added to that is the high energy density of the power source. “You don’t need much fuel,” noted Hutton. “A full load for an Islander is around 35 kilograms.”

While it is too early to determine exact maintenance schedules, a hydrogen fuel cell stack has no moving parts. That has led CAeS to conclude that maintenance costs are likely lower for the hydrogen-powered Islander by as much as 15 per cent. “Although these are new technologies in aerospace, fuel cells have been driving around for two decades in cars, so there is some experience of how long overhauls are required of a fuel cell system. We think there’ll be considerable operating savings. The more you fly it, the more you save.”

That combines to make CAeS’s converted aircraft an attractive proposition, not just for sub-regional commercial carriers but also for larger airlines that envisage using this category of aircraft either as a means of getting their sustainability programmes off the ground or as a testbed for when hydrogen does, eventually, become a realistic option for larger narrow and widebodies.

At the smaller end of the market, CAeS has signed a three-party agreement with MONTE Aircraft Leasing and Australian air charter company Torres Strait Air (TSA) to convert up to ten Islanders to hydrogen-electric power. The deal, which comes shortly after TSA signed a letter of intent for ten new conventional Islander aircraft, will see MONTE provide financing to the airline for the conversion of existing Islanders. The deal will enable TSA, which currently operates a fleet of 11 aircraft from Horn Island, to offer the option of zero-emission flight to its passengers.

In Oceania, CAeS has been named the sole hydrogen-powered aircraft partner of Air New Zealand’s Mission Next Gen Aircraft, the flag carrier’s sustainable aircraft programme. CAeS will work alongside three other companies on a zero-emissions demonstrator. One or more of these will be chosen with the expectation that Air New Zealand will purchase an aircraft for delivery in 2026. Drone developer Dronamics has signed an MoU to progress further the application of the CAeS HFPCS





CLOCKWISE FROM LEFT:

The hydrogen Islander aircraft will have fully optimised zero-carbon technology which will allow the aircraft to carry out many missions it fulfils today in its conventional configuration

With a 60-minute flight duration plus a 45-minute reserve, the product hydrogen Islander has a 200km range plus reserve

The demonstrator aircraft is set to begin a test flight programme in 2024, with the view to certifying the hydrogen version of the Islander for commercial entry into service in 2026



to the Dronamics Black Swan cargo drone aircraft, which is capable of carrying 350kg for up to 2,500km. The two companies have been working together since November 2022, under an earlier MoU, on a feasibility study for applying CAeS's HFCPS technology into Dronamics' Black Swan.

CAeS is also working with Luton-based low-cost carrier easyJet, whose principal aim is to understand the technology behind hydrogen propulsion, particularly given its position as an all-Airbus fleet operator (Airbus is exploring how hydrogen can be integrated into its next-generation aircraft designs).

Thinking big later

After the nine-seat Islander, CAeS has a multi-phase programme that includes the development of larger aircraft with up to 100 seats. A 19-seat aircraft is where CAeS was expected to look next, but Hutton said a clean-sheet design for that type was "paused while we look at how best to exploit other opportunities". The thinking is that the fuel supply industry is not yet sufficiently developed to support a wide-scale rollout of larger, more fuel-hungry, hydrogen-propelled aircraft.

Monetising the technology on smaller aircraft is the logical first step, explained

Hutton. There will be a "massive" market for smaller aircraft, and the 19-seater would likely follow around 2032, with the 100-seater expected closer to 2035. "The larger aircraft are quite a way away," he said. "For many decades, nobody developed new sub-regional aeroplanes because the conventional wisdom was that the way to make air travel affordable and commercially viable was ever larger aeroplanes, flying longer distances to a smaller number of bigger hub airports – because you got your return by getting more people in a bigger, fuel-efficient, modern aeroplane.

"But the sub-regional aircraft are the only ones that are going to be able to get the zero emissions systems first because you can't put it in a big aircraft, so you've got to start there, prove it and then work up."

In the short to medium term, CAeS has its work cut out bringing its hydrogen propulsion system to market. But Hutton is convinced that hydrogen will "win out" as the technology of choice for sustainable aircraft: "It'll take a good 15 to 20 years before batteries become useful enough to have a role that's more than just your two-seat PPL-type training. Because of the energy density, I think hydrogen will be the principal solution." **AI**



As a company focused on electro-optical (EO) systems, Safran brings 40 years of experience in the development of such technology, which has resulted in its products equipping military platforms as diverse as submarines and helicopters, aircraft, aerostats, and drones, each of which brings its own problems and solutions to overcome. With a diverse range of operating platforms and the ability to develop

optical sensors in-house, Safran has supplied more than 1,000 models of their Euroflir EO series to the military, parapublic, and commercial operators such as European EMS clients. The latest version of the Euroflir 410 is already in use on the French Navy's new Airbus H160 helicopters, and it has been selected for the Beechcraft King Air 350 retrofit programme to replace the older EO/IR [Electro-Optical/Infra-Red] systems currently in use.

With a focus on military platforms,

Safran has developed a well-practised procedure to meet customers' needs, as explained by a company representative: "Regarding military applications, we [Safran] design the technology from the sensor to the shooter to support our customers in their ISR/ISTAR [Intelligence, Surveillance and Reconnaissance/Intelligence, surveillance, target acquisition, and reconnaissance] mission and target acquisition.

"Looking at the civilian requirements, our products are used for SAR,



The proposed European MALE remotely piloted aircraft system (RPAS) will be equipped with the Euroflir 610 high-performance airborne electro-optical system. The 25-inch optronic system will be critical for Europe's RPAS's ISTAR missions

Airbus

Operating in poor weather conditions or at night is essential for militaries and for search and rescue services, with both missions requiring exceptional technologies for success. **Glenn Sands** spoke to Safran Electronics and Defense about their latest systems

Eyes on the future



maritime and coastline surveillance, pollution, and fisheries monitoring. Within these two markets, our intelligence processing – available through our Euroflir 410 and 610 – is designed to meet this wide array of applications.

“Euroflir 410 is tailored to meet the exact needs of our customers, in part due to the availability of several hardware and software options. The modularity makes it attractive to law enforcement and military clients, with some dual-use and military versions. Additionally, Euroflir can be connected to any mission system and is already integrated with CarteNAV, Churchill and Euronav.”

The vast cross-section of platforms currently operating with Euroflir systems include both fixed-wing and rotary, each presenting challenges for EO, particularly regarding vibration, which can lead to image distortion.

A Safran spokesperson added: “Safran has developed an advanced stabilised system with passive and active stages to guarantee a stable image in a broad range of environmental conditions. The passive stage consists of dampers suspending the sensor core inside the gyro-stabilised platform to filter out as many vibrations as possible. The functional stage features an embedded inertial measurement unit that feeds a high-speed controller—the two work together to cancel any disturbances that go through the passive stage in real-time.

“Euroflir 410 and 610 can be hard-mounted onto fixed and rotary-wing platforms in this configuration. Hard mounting the electro-optical system onto the aircraft avoids additional dampers, which add weight and suffer from wear and tear. This unique feature benefits the integrator for ease of integration

and the end-user for weight saving and maintenance.”

No crew needed

With UAVs taking on ever-increasing roles in both the military and commercial sectors, the need to adapt onboard EO systems to what may well be a smaller platform and the crewless could present its own set of challenges – not according to Safran though: “Both the Euroflir 410 and 610 have been designed to fit onto any platform. With its embedded inertial measurement unit, the Euroflir provide precise ground and onboard localisation. It means they are stand alone and can be integrated into inhabited or habited aircraft. We’ve customers with mixed fleets of both manned and unmanned platforms, and they easily use the same EO systems for both.”

But there are still challenges when





taking this unmanned route, as Safran's representative continues: "The main difference in these platforms is that the tactical operator is either in or outside the aircraft for command, control, and video analysis. One of the challenges of controlling an EO system at a distance, using either line-of-sight or satcom, is the induced latency. For the Euroflir 410 and 610, this has been optimised to its maximum. Regarding video transmission, UAVs have limited bandwidth, so the amount of data going down to the ground is limited due to their embedded software and AI (automatic tracking, moving target indicator, hotspot detection, enhanced resolution, etc), which assists in reducing the operator's workload. With the 410 and 610, videos can be processed onboard before being compressed to fit the downlink bandwidth. There's also the option to embed video on the 410 and 610 with STANAG 4609, which offers an advantage for applications such as UAVs in which video streams are brought down to the ground."

High altitude, but still high quality

The capabilities of the Euroflir 610 have made it particularly suitable for maritime patrol platforms and transport aircraft, and perhaps the most interesting is that the baseline Euroflir 610 has met the requirements for the European Medium Altitude Long Endurance (MALE) RPAS, as the Safran representative explained: "The MALE RPAS is designed to operate at high altitude, and one of the challenges is the ability to have an EO system that can operate at altitude and with a large temperature gradient. To

ensure the system's performance in these environmental conditions, the electro-optical system's stabilisation needs to be paramount.

"The challenges set by UAVs also stand in the bandwidth for data transmission from the UAV to the ground through the image chain. To reduce the operator workload, the FIR [finite impulse response] for the bandwidth for data, Euroflir 610 embarks on advanced image processing including multi-target, moving target indicator, hotspot detection, and enhanced resolution."

From the briefing with Safran Electronics and Defense, it is clear that the company is focused on continuing to integrate its line of EO systems onto any platform that needs high-end EO capability. Many air arms and parapublic organisations will look towards Safran for the foreseeable future. **AI**

CLOCKWISE FROM LEFT:

Several civilian and commercial organisations have adopted Euroflir 410, which has been integrated into Diamond Aviation's DA-62 Multi-Purpose Platform, with the operator's stations in the second row. This combination is used for land mapping, oil spill detection, border patrol and law enforcement operations

Safran Electronics and Defense

Due to its ultra-wide telescope, Euroflir 410 can provide state-of-the-art resolution back to the aircrew

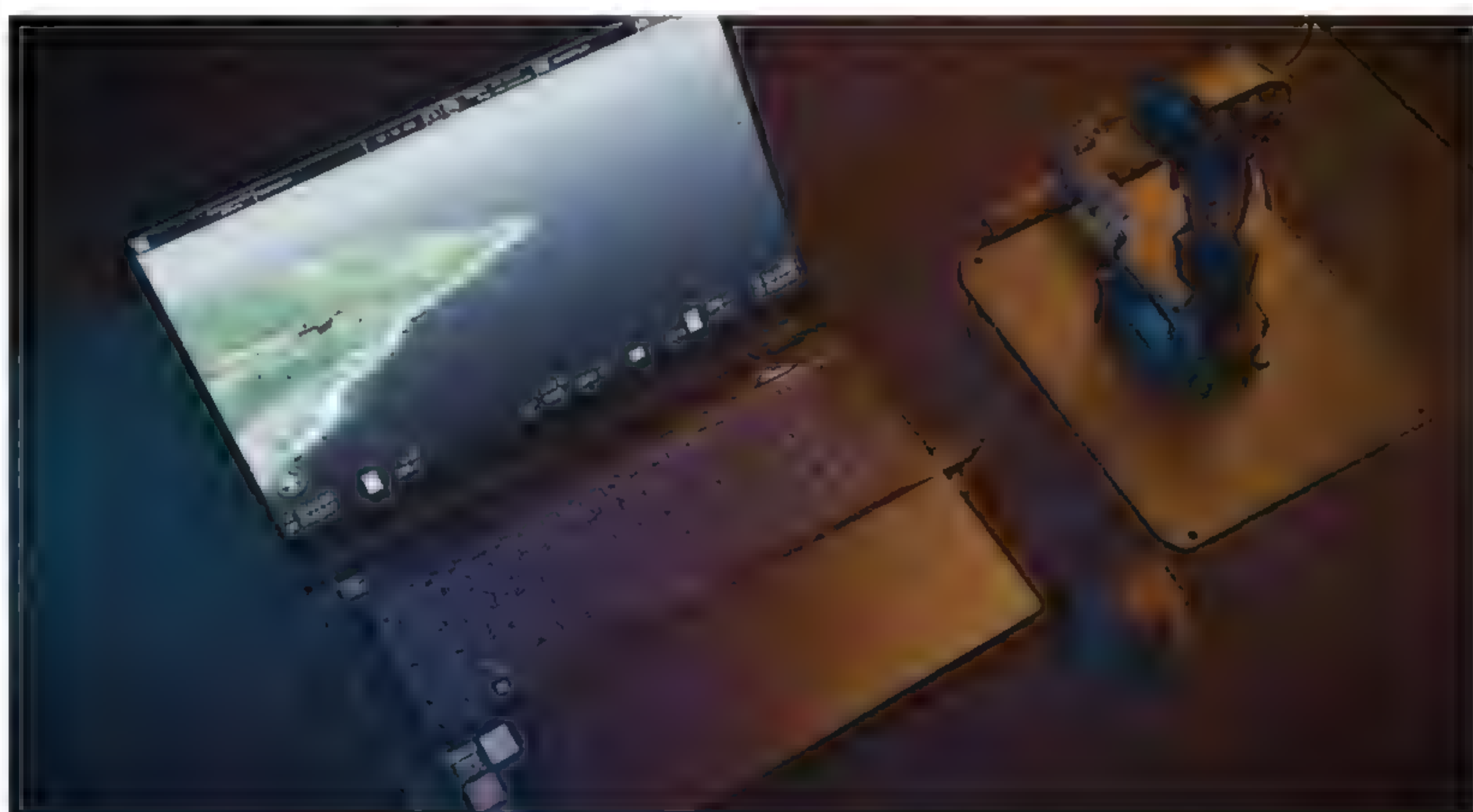
Safran Electronics and Defense

Euroflir 410 operators learn to use the turret and its system on the ground using the TiMS training simulator

Safran Electronics and Defense

The French Navy introduced the Euroflir 410 across a number of its platforms, including the Airbus H160, which only entered service in September 2022 for SAR missions

DGA EV



Fast and


Four years before Steve Jobs unveiled the first iPhone to the world at the 2007 Macworld tradeshow, ushering in a new wave of mobile communications in doing so, a technological revolution of another sort had taken place in the air, involving not a smartphone, but the laptop.

In 2003, Lufthansa and British Airways undertook respective three-month service demonstrations of Connexion by Boeing, an in-flight connectivity (IFC) service from the airframer that had hitherto been available to the executive services market, which included operators of private and government aircraft, in the US.

Lufthansa made the service, which it rebranded as FlyNet, available free-of-charge throughout the cabin of a 747-400 aircraft, allowing passengers to use their personal laptops and ones provided by the airline to gain high-speed connections to the internet, including full access to their personal or business email accounts and files. They were able to attach files to their outgoing emails or open attachments from incoming emails, get the latest news, look up information about their destination or shop online.

Speaking at the time, the then Connexion by Boeing President Scott Carson said the service gave passengers “new and unprecedented choices for managing their time in flight and on the ground”, adding that “Lufthansa is widely recognised and respected as a leader in innovation, in communication and in customer service, and is demonstrating to its passengers today what the world of tomorrow will be like.”

By May 2004, the German airline had installed the service on five A340-300 aircraft in its long-haul fleet, committing to install the service on all its long-haul aircraft on all long-haul routes from Munich and Frankfurt by 2006.

The FlyNet portal gave passengers free updates to current news, travel information, 

Free Wi-Fi is abundant on the ground, but in-flight the picture is a little different. Airlines are adopting various approaches to offering complimentary in-flight connectivity, with many flavours of free on the menu. **Alex Preston** looks at what free really means



Free



Program with Wi-Fi enhancement
and 10,000 Economy Class
tickets to connect weekly for free

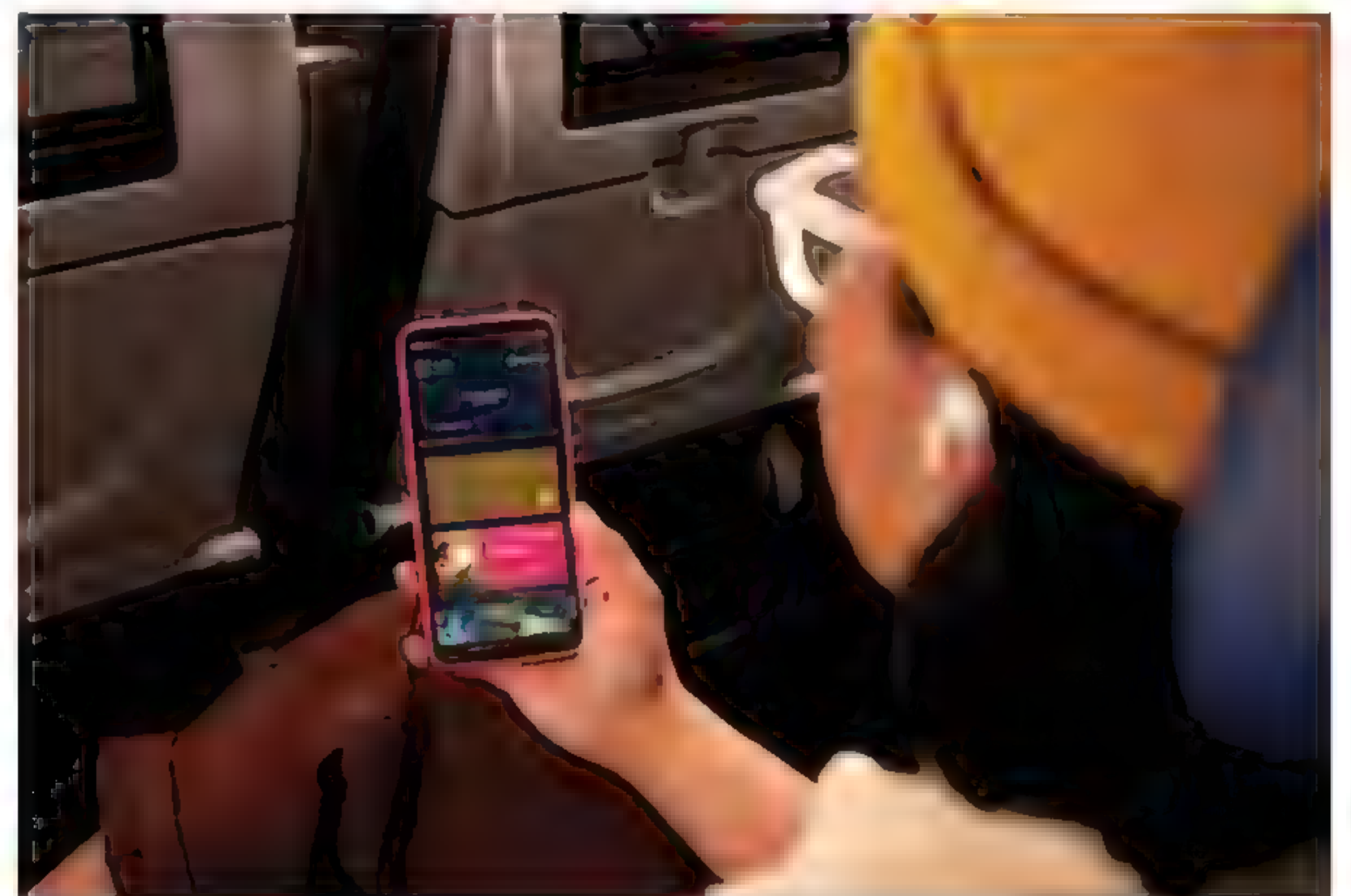
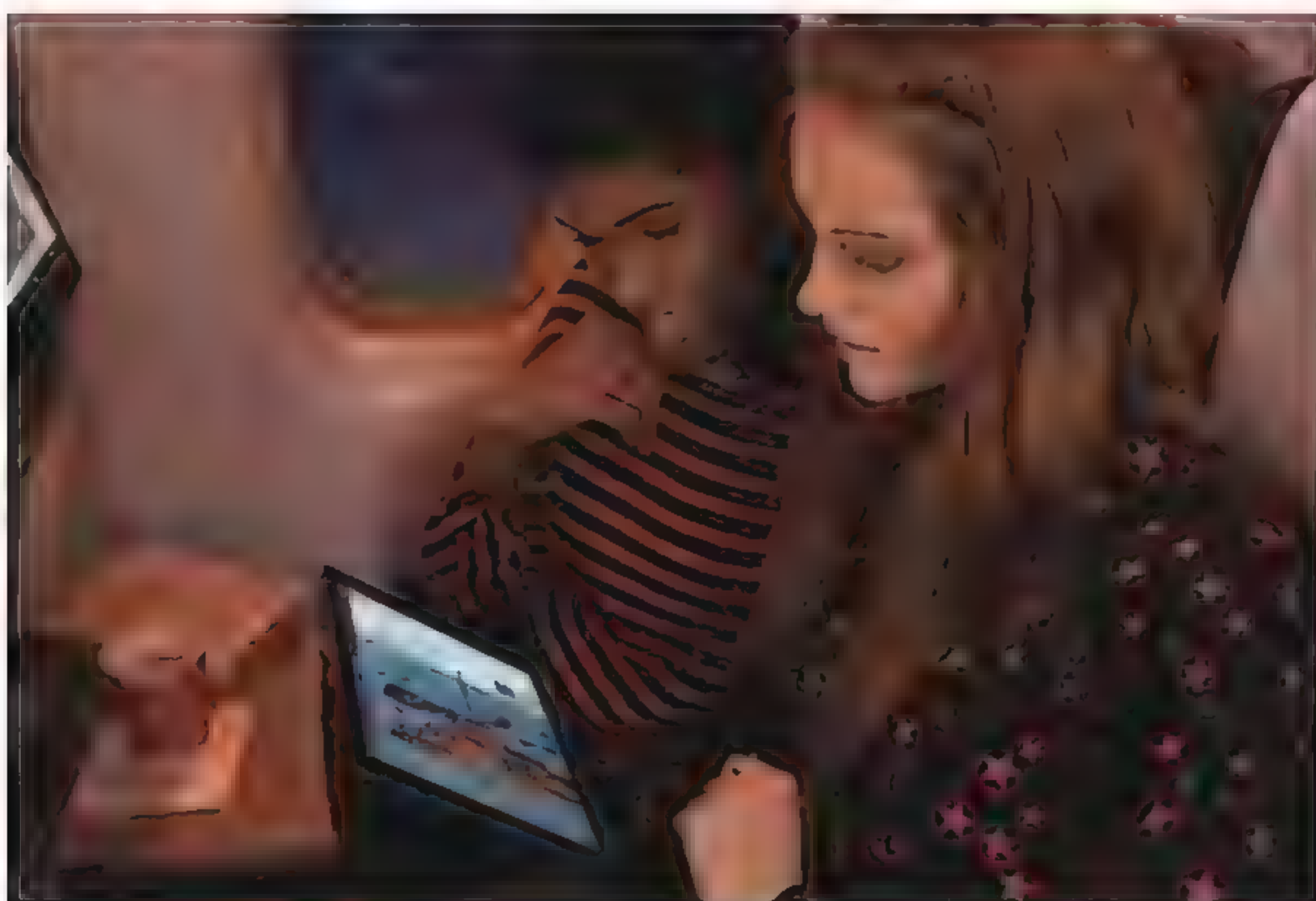


shopping possibilities and frequent flyer details. For a flat rate of US\$29.95 dollars for the entire flight or a metered option of US\$9.95 for 30 minutes and 25 cents per minute thereafter, passengers could access the Connexion by Boeing service for web browsing, send and receive emails with attachments and set up a secure data connection via a Virtual Private Network (VPN) to their corporate intranets or mail servers.

Connexion by Boeing had definitive agreements with Lufthansa, Scandinavian Airlines System, Japan Airlines, ANA and Kingdom Holding Co. to equip their long-haul aircraft with the service. In addition,

Singapore Airlines, China Airlines and Korean Air announced their intent to install the Connexion by Boeing system on their long-range aircraft.

However, in 2006, Boeing confirmed it was discontinuing its Connexion by Boeing service and began work on an orderly phase out. The move prompted the then Boeing Chairman, President and CEO Jim McNerney to state that: "Over the last six years, we have invested substantial time, resources and technology in Connexion by Boeing. Regrettably, the market for this service has not materialised as had been expected."



Undeterred, in 2011 European low-cost carrier Norwegian became the first airline to offer in-flight Wi-Fi on all European routes, when it selected Row 44 to supply the service across its fleet of 737-800 aircraft. "This is a product that no other airline in Europe is currently offering, which gives us a huge competitive advantage," said Director of IT and Business Development, Hans-Petter Aanby, at Norwegian at the time.

At the end of 2013 JetBlue launched Fly-Fi, its branded in-flight internet product developed over two years in association with its wholly owned subsidiary, LiveTV, and Viasat.

In 2017, supported by Amazon Video, JetBlue made the service completely free.

The service was based on CabinConnect by Collins Aerospace, which uses the Inmarsat Global Aviation (GX) satellite network.

Retrofit installations have already begun, with future new aircraft to be delivered with the service over the coming years as a priority.

For years, JetBlue remained the only airline to offer complimentary in-flight



He continues: "Unsurprisingly, free/freemium Wi-Fi is most common in North America where JetBlue, Delta Air Lines, and United Airlines, all offer some form of free. Elsewhere, the movement is being led by flag carriers such as Emirates, Lufthansa, and Singapore Airlines."


Delta announced the introduction of free Wi-Fi, presented by T-Mobile at CES 2023. Now, with the service ten months old, the airline has revealed that more than 115,000 SkyMiles Members

JetBlue

T-Mobile is providing free Wi-Fi to Delta SkyMiles members as well as its own customers with relevant plans Delta

A number of airlines make being a member of their loyalty programmes a necessity to access free Wi-Fi
SWISS

JSX is the first airline to activate the Starlink IFC service JSX



SWISS Connect

Wi-Fi packages and pricing

		Messaging	Wi-Fi 4 Hours	Wi-Fi Premium
Duration		Full flight	4 hours	Full flight
Features	Text messaging (e.g. WhatsApp)	✓	✓	✓
	Photo sharing	✓	✓	✓
	Social media		✓	✓
	Email		✓	✓
	Audio streaming		✓	✓
	Embedded video*		✓	✓
	VPN		✓	✓
	Cloud services		✓	✓
Price		Free	CHF 100	CHF 150

☐ Digital SWISS Magazine, Travel ID registration and sustainable offers available during the entire flight

☐ Register now for the Travel ID and Miles & More to access the "Messaging" package easily in the future

(Delta's loyalty program) connect to its in-flight Wi-Fi daily.

At the time of writing more than 600 domestic mainline aircraft are equipped with the service, with passengers logging more than 32 million streaming-quality sessions in the past year.

Speaking to the Delta News Hub, Julieta McCurry, Delta's Vice President of In-Flight Entertainment and Connectivity, disclosed that its fast, free Wi-Fi ranks among the top three drivers of customer satisfaction on Delta. "So much that it actually improves the entire onboard experience as a result. Customers value connection," she said.

Delta is now extending free Wi-Fi to regional aircraft and its short-haul routes with its fleet of Boeing 717s, following a recent contract with Hughes. From mid-2024, more than 400 aircraft will receive the new Wi-Fi equipment.

In Asia, Malaysia Airlines recently announced all passengers, regardless of loyalty status and cabin class, would now no longer be required to subscribe to the airline's pay-per-use Wi-Fi.

Complimentary Wi-Fi was being extended to passengers across all travel classes on selected widebody aircraft (six A350-900, nine A330-300 and five A330-200s). The service will be rolled out on selected narrowbody aircraft in phases at a later date.

The announcement comes just four months after the airline introduced complimentary in-flight Wi-Fi for Business Suite and Business Class passengers, as well as Enrich Platinum members, including those seated in Economy Class, with a data cap of 100MB per sector.

As Ahmad Luqman Mohd Azmi, Chief Executive Officer of Airlines from Malaysia Aviation Group (MAG), explains: "Unlike previous data capping, we now offer unlimited data, allowing guests to conveniently stay connected throughout their journey – whether connecting with their loved ones or for work purposes throughout their journey with us. We remain dedicated to ensuring that every

"Unsurprisingly, free/freemium Wi-Fi is most common in North America where JetBlue, Delta Air Lines, and United Airlines, all offer some form of free."

David Whelan, senior research analyst, Valour Consultancy

aspect of our service is designed to make our customers' journey as seamless, hassle-free and enjoyable as possible, and will continue to invest in initiatives that will greatly benefit their experience onboard Malaysian Hospitality."

The disruptor

One of the biggest shake-ups of the in-flight connectivity market has been caused by the arrival of Starlink Aviation, the connectivity services arm of the Elon Musk-backed SpaceX.

Speaking at the Satellite 2022 conference in Washington DC, SpaceX's Vice President of Starlink Commercial Sales Jonathan Hofeller declared that "Connectivity on airplanes is something

that we believe is ripe for an overhaul."

Starlink Aviation is high-speed, low latency in-flight internet with connectivity across the globe, including the polar regions, thanks to a fleet of Low Earth Orbit (LEO) satellites.

Starlink claims to deliver up to 350Mbps (megabits per second) download speed to each plane, enabling all passengers to access streaming-capable internet at the same time. With latency less than 20 milliseconds (ms), passengers can engage in activities previously not functional in flight, including video calls, online gaming, virtual private networks and other high data rate activities.

To date, Starlink's customer base is small – just five airlines, and only one



of those with an active service – but considering the relative youthfulness of the company, its no small achievement.

ZIPAIR in Asia, Hawaiian Airlines in North America, Qatar Airways in the Middle East and airBaltic in Europe are the other airline customers to have signed up to Starlink.

According to an airBaltic spokesperson, the Latvian airline airBaltic is in regular communication with SpaceX and Airbus on the required STC (supplemental type certification) for equipping the airline's fleet of Airbus A220-300s with Starlink in-flight internet connectivity. Currently, the airline expects to begin installing the product in 2024.

North American-based "hop-on jet

service" operator JSX, was the launch airline of the Starlink service. By early 2023, its entire active fleet of 40 Embraer ERJs (ERJ-135s and ERJ-145s) was kitted out with the service and flying as a complimentary amenity for passengers.

The unique tenet of the Starlink service is its open portal and one click access. There is no login page or sign-up procedure. "Our approach to connectivity in the sky is much like it is at home: you walk into your house and the internet just works. It's simple. It's high speed," Hofeller has said.

While the frictionless approach is of obvious benefit to passengers, the absence of a captive portal which may require some form of passenger

ABOVE:

Delta sees more than 115,000 SkyMiles members log in to its free Wi-Fi service Delta

INSET:

Having introduced free Wi-Fi to over 600 domestic mainline aircraft during 2023, Delta is bringing free Wi-Fi to its regional short-haul fleet

Delta



In 2011 Norwegian was the first airline to offer Wi-Fi on single aisle aircraft in Europe
Norwegian

authentication, removes the opportunities for airlines to cross-sell and realise ancillary revenues as well having increased control over their internet bandwidth since they can limit usage.

Away from this approach, how does the business model traditional work for airlines?

Flavours of free

"Well, the first thing to point out is that there are still very few examples of a truly free unlimited experience," emphasises Whelan. "Most of the airlines offering free Wi-Fi do not allow data-hungry streaming as part of those plans, instead focusing on messaging, and sometimes surfing. This helps to constrain costs."

For instance, from mid-January 2024, Lufthansa will offer unlimited free messaging from services such as WhatsApp, Facebook Messenger and Telegram, on its short- and medium-haul flights on aircraft from its A320 family that

are equipped with Wi-Fi.

At the same time, for all other internet packages on board, such as streaming, the tariff will be reduced by almost 50%.

"Lufthansa is investing around €2bn in product and service improvements. In the process, we have implemented and planned many large, medium, and also smaller initiatives that make travelling with Lufthansa an even better experience," says Heiko Reitz, CCO Lufthansa Airlines. "One great example is Free Messaging. I am pleased that our guests will in future be able to stay in touch with their relatives or business partners above the clouds – free of charge."

The free service is accessible by logging into FlyNet with a Miles & More service card number or with an e-mail address registered with the Lufthansa Group Travel ID. A new login or registration is also possible during the flight.

The move follows the decision of sister airline SWISS to introduce free messaging



on all long-haul flights, in all classes of travel, throughout the flight and with no data limit.

Airlines are also using a combination of sponsorships, advertising, and partnerships with mobile network operators (MNOs) to help balance the cost of free Wi-Fi. "Having said that, IFC can remain expensive, and many airlines have come to accept that the expenditure is worth it in order to improve the customer experience and increase passenger loyalty. Indeed, a number of airlines make being a member of their loyalty programmes a necessity to access free Wi-Fi," states Whelan.

One such airline is Emirates, which in mid-2023 enhanced its in-flight connectivity so that passengers in every class of travel had some form of free connectivity once they had signed up to Emirates Skywards.

The development has resulted in an additional 30,000 Economy Class

passengers connecting to complimentary onboard Wi-Fi every week, the airlines says.

The airline says the increase in free connectivity has been very well received by its passengers, following changes in January 2023, highlighting that its service averages of 450,000 users per month. This represents a 30% increase of passenger use in 2023 versus the same period last year. Currently almost 10% of all passengers are utilising the complimentary onboard Wi-Fi. On routes through the Americas, almost 20% of passengers connect to Wi-Fi onboard, and on European and Africa routes the usage is over 11% of all passengers.

As Patrick Brannelly, SVP Retail, IFE & Connectivity commented: "Emirates has persistently worked with our service providers to optimise and improve the connectivity experience. In March we delivered about 55% more data per customer session compared to early 2022 despite the number of sessions increasing by 68% in the same period. We will continue to work to invest in upgrades and enhancements, and our A350 aircraft will arrive with the next generation of satellite connectivity already equipped."

To date, the airline has invested more than US\$300 million dollars into onboard connectivity.

A word from our sponsor

In June 2022, T-Mobile launched Coverage Beyond, in co-operation with Alaska, American, Delta and United. T-Mobile partners with Intelsat, Viasat, Thales and Panasonic to provide the free service.

In addition to texting, browsing and emailing, Coverage Beyond allows T-Mobile customers to also stream, where available, all flight long too.

High-quality Wi-Fi that supports unlimited streaming on board will become the standard for airlines in the next decade believes Kevin Jackson, Executive Vice President and Chief Commercial Officer at Porter Airlines.

"More and more, passengers expect to be connected while in flight, and with the technology now available, carriers will need to offer full connectivity in order to remain competitive," he says.

On Porter's E195-E2 aircraft, every passenger enjoys free, fast Wi-Fi that enables them to be productive using their own device, surf the web or stream their favourite entertainment from platforms such as Netflix and AppleTV.

The airline works with Viasat to provide the service, which allows work gate-to-gate, and will be factory-installed on an additional 20 new Embraer E195-E2 aircraft on order. The first of these new aircraft are scheduled to begin service next year.

"It's clear that our passengers value the high-speed and high-quality Wi-Fi on our E195-E2 fleet, which allows them to stay

entertained or connected to work while in the air," says Jackson. "Our commitment to make the Wi-Fi fast and free has helped build on our award-winning approach to hospitality as we continue to expand across North America."

The service is supported by advertising. As a VIPorter member, passengers logging on will only see an ad at the beginning of their session. They can also join the program at any time in-flight to view unlimited content after watching a single ad. If they are not logged in as a VIPorter member, they will see an ad every 30 minutes.

While Porter's passengers can't press fast forward on adverts, passengers in general are happy to forego an ad blocker. So, says Viasat's Passenger Experience Survey 2023.

Surveying over 11,000 people worldwide, 42% of passengers claim they are willing to see an advertisement with 38% expecting to see adverts in exchange for free Wi-Fi.

Other takeaways from the survey include the fact that 83% of those surveyed reported they are more likely to rebook with an airline that offered quality Wi-Fi, while 81% said Wi-Fi was important to their onboard experience.

Half of respondents say they are less likely to connect to in-flight Wi-Fi if they had to pay. Moreover, three in ten passengers surveyed (29%) are willing to pay more for their ticket to benefit from free Wi-Fi. Other than ticket price, free in-flight Wi-Fi has become the most influential factor for passengers when choosing an airline (22%) – ahead of free food and drink (18%), legroom (13%), and free entertainment (9%).

As Viasat's Passenger Survey 2023 concludes: "Gone are the days in which in-flight Wi-Fi was simply a 'nice to have'. Today, reliable connectivity is an essential to many passengers. Fast and free in-flight Wi-Fi is quickly becoming the same." **AI**

Change is in the air

Air traffic management is undergoing a major refresh in the UK with revised procedures and new technology.
Mark Broadbent reports

Air navigation services provider NATS is undertaking a significant work programme to improve UK air traffic management. Lee Boulton, NATS Head of Airspace Development, told *Air International*: "Airspace modernisation covers both the transformation of the network route design and integration of new airspace users and is supported by new tools and technologies."

Boulton explained the bigger picture: "The UK's Airspace Modernisation Strategy is sponsored by the Department

for Transport and the Civil Aviation Authority. It identifies the elements the UK's aviation industry will need to deliver and contribute to achieve 'net zero' by 2050. NATS plays a central role in airspace modernisation, alongside the government, airlines, airports and other airspace users."

The aviation industry's sustainability targets are, Boulton pointed out, "a central driver for modernisation across the airspace network and within our operation".

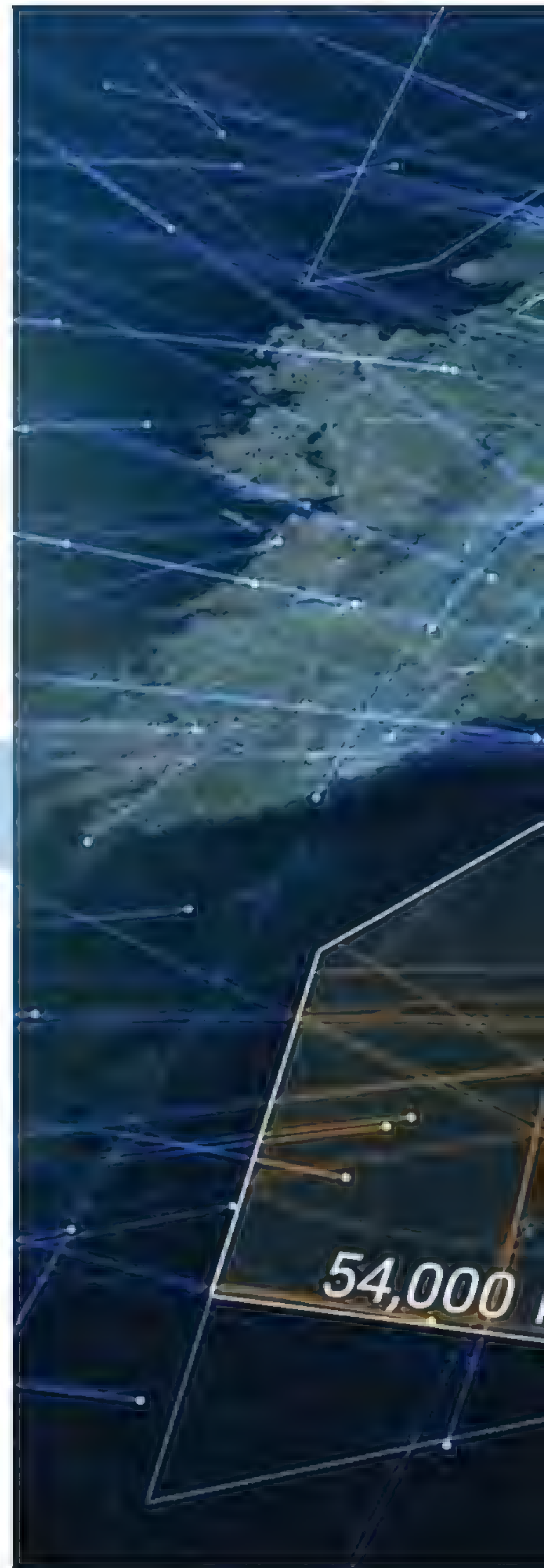
Airspace changes

He said: "In the last two years, NATS has implemented nine airspace changes

to modernise and improve efficiency in the UK's airspace network. Combined, these are already enabling savings of nearly 60,000 tonnes of carbon dioxide annually."

Boulton added: "With the rollout of the airspace modernisation programme, we are transforming the network structure itself. Implementing new tools and technologies combined will contribute to a more efficient future for air travel."

Key to the work is the London Airspace Modernisation Programme (LAMP), a series of airspace change projects across Terminal Control Areas (TMAs) in UK airspace. LAMP is also





called the Future Airspace Strategy Implementation (FASI) Programme and has been expanded to cover the Scottish and Manchester TMAs.

Boulton said: “TMA projects contribute to the UK masterplan that outlines how FASI will deliver airspace modernisation. The projects will transform the en-route network in the Scottish, London and Manchester TMAs.

“Our projects are responsible for the network Airspace Change Proposals, which contain changes in the UK network above 7,000ft, as we work closely with airports modernising their airspace below 7,000ft.”

Free Route Airspace

NATS has introduced Free Route Airspace (FRA) operations across a significant portion of UK airspace.

Boulton explained: “FRA is a volume of airspace where the conventional routes – the ‘motorways in the sky’ – are removed, generally in the upper-level network above 25,000ft. FRA introduces a defined entry and exit point into the airspace, enabling aircraft to choose the route they want to fly through a given volume of airspace.”

He pointed out: “This gives airlines the freedom to plan and fly their optimal route, taking things into account such as weather and wind speed. With modern

aircraft technology and navigation systems, we can make high-level flying much more efficient.”

NATS deployed the first portion of FRA in the UK over Scotland in December 2021, removing long-established high-level routes to enable aircraft to choose their most direct flight path. Boulton noted this “crucial area of UK airspace supports 80% of transatlantic traffic”.

He described the introduction of FRA in the UK as a “key milestone” towards the wider Single European Sky, the initiative launched in 2004 to tackle the fragmentation of European airspace by bringing together civil and military

PREVIOUS PAGES:

A visualisation of the West Airspace Deployment was introduced in March 2023

All images via NATS unless stated

CLOCKWISE FROM RIGHT:

The West deployment simultaneously introduced free routes and systemised airspace

'Digital working capability' will supplement Farnborough controllers' visual reference

Project AMEC, which involves NATS and Virgin Atlantic, will demonstrate the feasibility of advanced air mobility in the UK using Vertical Aerospace's VX4



stakeholders and government institutions across the continent.

The Single European Sky aims to develop innovative technologies and ways of working to improve the safety, network capacity, cost-efficiency and environmental performance of ATM.

Boulton said: "FRA will make it possible to meet the demands of airspace users into the future." Once fully implemented at the European level, EUROCONTROL forecasts a reduction of some 20 million tonnes of carbon dioxide emissions compared to today.

Systemisation flight paths

Free Route Airspace relates to the higher-level network above 24,500ft. At lower altitudes, NATS has introduced what it calls Systemisation – highly defined flight paths for

operations between 7,000ft and 24,500ft.

Boulton explained: "By using modern aircraft technologies and airspace design thinking, these flight paths enable aircraft to use the available airspace as efficiently as possible while reducing the number of controller interventions to operate the airspace efficiently."

He said: "To design a systemised network, we use Performance Based Navigation [PBN], which uses satellite technology on modern aircraft, allowing them to fly on precise routes from take off until they reach the higher-level network."

West Airspace Deployment

In March 2023, NATS undertook a significant first for the UK – simultaneously introducing both Systemisation and FRA in the West Airspace Deployment.

Also known simply as West, the deployment was in development for four years. A NATS statement said: "West will transform a third of the UK's airspace infrastructure." The agency described it as "one of the most technical and complex projects" it has ever undertaken.

NATS explained that PBN-based Systemisation has been implemented above 7,000ft to 24,500ft in the first large-scale introduction of a systemised network in the UK. No changes have been made to the airspace below 7,000ft. According to Boulton, Systemisation "...gives airlines and airports greater predictability, while the potential for delay is reduced."

West simultaneously saw the deployment of the second tranche of FRA in the UK following the first over Scotland, enabling aircraft in the high-level network





above 24,500ft to fly their preferred route between a defined entry and exit point.

According to NATS, the West deployment will save 12,000 tonnes of carbon dioxide per year and, for aircraft using the airspace, bring a two-hour “cumulative reduction in flying time per day” and save 150,000 nautical miles of flying per year.

XMAN and Oceanic

Free Route Airspace and Systemisation followed several other airspace modernisation projects coming online in the UK in the 2010s.

Cross Border Arrivals Management (XMAN) was introduced at London/Heathrow Airport. This system sees airborne delay data at the UK’s largest airport shared with partner air navigation service providers (ANSPs) on mainland Europe using Exelis Orthogon AMAN and Snowflake GO Publisher technology.

If a delay is sufficient, partner ANSP controllers start to slow the aircraft down at a distance of 350 nautical miles from Heathrow. This multinational co-operative

approach aims to absorb delay in the more fuel-efficient and less congested cruise phase of a flight, thereby reducing stack holding times at Heathrow and, in turn, fuel burn and emissions.

Another innovation, introduced in 2019, was the Aireon aircraft tracking and surveillance service in UK oceanic airspace. Using satellite-based ADS-B (automatic dependent surveillance-broadcast) transmissions, the system enables smaller 14nm separation distances between aircraft (down from 40nm), enabling the fastest and most efficient trajectories for transatlantic flights.

Elsewhere, NATS has introduced small-scale changes in its Swanwick and Prestwick operational centres under the Operational Service Enhancements Project (OSEP), which Boulton said bring “substantial benefits to the operation, NATS’ customers and the environment”.

There have been six OSEP deployments so far, with further changes planned. Boulton said: “The latest deployment, called OD6, resulted in an overall carbon dioxide saving of 30,000 tonnes throughout the UK

and European networks.”

A new software tool called AirTop enables accurate modelling of the potential flow of aircraft through UK airspace. “By factoring in varying aspects such as routes, new aircraft types and overall traffic volumes, and referencing thousands of navigation points, airspace sectors and aircraft flight plans, AirTOP generates a comprehensive 4-D profile of each flight,” Boulton said.

“The software also allows flights to interact with each other, akin to real-world operations. Stack holding, arrival sequencing and departure spacing are all simulated, allowing for a deeper understanding of the impact that congested airspace can have on fuel burn and carbon dioxide emissions.

“Armed with this knowledge, we can design airspace which meets a range of principles while aligning with our objective to achieve carbon negativity by 2040.”

Digital tower

Recent NATS technology innovation is not limited to airspace. In October 2023, ➡

“Close collaboration across a broad range of stakeholders is essential to realise a modern, integrated airspace structure across the UK”

Lee Boulton, head of airspace development, NATS



the agency announced Farnborough Airport will become the first UK airport to adopt a next-generation ‘hybrid’ digital control tower using products from Searidge Technologies, a digital tower platform supplier.

NATS said a “new digital working capability” will provide the airport’s controllers with “enhancements to manage aircraft both by direct visual reference from the control tower window as they do today, and via fully interactive panoramic video presentation on the screen displaying key parts of the airfield”.

Strategically placed ultra-HD cameras will provide the controllers with customisable views of the airfield, including around Farnborough’s new, state-of-the-art hangar development, Domus III, due to open in 2024.

Designed to accommodate new, larger business aircraft, including the Dassault Falcon 10X, Bombardier Global 7500 and Gulfstream G700, and house eVTOLs, the 175,000 sq ft Domus III is, according to Farnborough Airport “centrally located in a prime position adjacent to the airport’s two main taxiways”.

A NATS statement said: “Not only will the cameras be able to provide views that could otherwise be distant or obscured from the tower, but Searidge’s technology platform will give the controllers access to tools which provide improved tracking of

OPPOSITE:

A controller at Cardiff Airport. NATS has undertaken various airspace modernisation projects in UK airspace

BELOW:

Farnborough Airport will become the first UK airport to adopt a ‘hybrid’ digital control tower





the whole airport surface via integration of new ADS-B surveillance and 'head-up' labelling of the panoramic video.

The report continues: "This new technology will allow the controllers to monitor individual aircraft and airport vehicles more effectively, boosting safety and efficiency, especially during low visibility scenarios like fog.

"The deployment is the first of its kind in the UK and represents the next evolution in airport air traffic management, delivering the technology enhancements of a digital solution, but within an airport's existing control tower."

Andy Taylor, NATS' Chief Solutions Officer for Digital Towers, said: "This is an exciting project, and we're delighted Farnborough Airport has chosen to work with us and Searidge Technologies. The solution they've adopted is a cutting-edge 'digital extension' for their existing tower asset, increasing its operational value and future-proofing it. It will allow Farnborough to make the most of their existing infrastructure while also supporting their ambitious development plans."

Farnborough will be the first live deployment for Searidge Technologies in the UK, following the installation of a non-operational digital tower 'laboratory' at Heathrow in 2018. Searidge has technology deployments in 40 countries worldwide.

UK eVTOL flights

NATS is part of the Future Flight Challenge, the £73 million UK Research and Innovation project to "develop and show integrated aviation systems and new vehicle technologies".

Those new vehicles are the emerging crop of electric vertical take-off and landing (eVTOL) platforms. Developers intend these aircraft to introduce a new era of advanced air mobility, for example, cross-city passenger flights or short-distance cargo transport by small drones.

Boulton said: "The Future Flight Challenge is currently in its third phase. Future Flight 1 and 2 helped us to understand how new eVTOLs and drones move, operate and perform. Phase 3 moves us to the next stage, showing us how new airspace users could interact with existing air traffic at airports and in a shared airspace."

Specifically, Phase 3 involves two R&D projects involving various industry players. Project AMEC will demonstrate the feasibility of an AAM ecosystem in the UK using Vertical Aerospace's VX4 eVTOL.

The consortium plans to conduct several test flights with the VX4. One will see the four-seat VX4 fly from Bristol Airport to an undisclosed airfield in southwestern England. In another, the VX4 will fly between London Heathrow

Airport and a new 'Living Lab' vertiport built and operated by Skyports Infrastructure at one of London's general aviation airports. The consortium will also conduct a simulated VX4 flight from London City Airport to Bristol Airport.

A separate element of the Future Flight Challenge Phase 3 is Project CAELUS, to develop the UK's first distribution network using drones to transport essential medical supplies and clinical samples in Scotland.

NATS is one of 16 organisations involved in Project CAELUS, alongside primes, small and micro enterprises and specialists in numerous areas – air vehicle manufacturing, unmanned traffic management, energy providers, infrastructure designers, medical packaging manufacturers, business, market and social analysts, and experts in digital modelling and simulations.

For both Project AMEC and Project CAELUS, Boulton said NATS will contribute "in developing concepts of operations, enabling the development of procedures and gaining regulatory approval".

Mark Balsdon, NATS' Head of Airlines and Airspace Users Customer Management, further explained in a September 2023 blog: "For drone flights, we [pre-flight] deconflict the uncrewed ➔

RIGHT
Project CAELUS will develop the UK's first distribution network using drones to transport essential medical supplies
 Skyports

BOTTOM
Since 2021, NATS has implemented nine airspace changes to modernise and improve efficiency in the UK's airspace network



aircraft with existing traffic, essentially ensuring safe passage for all at that point in time. These test flights mean that we can explore and advise on key aspects of drone activity, including vehicle operation, ground infrastructure and airspace integration."

Boulton highlighted the broader relevance of the Future Flight Challenge in helping to "provide a greater understanding of the technology – for operators, tech providers, air navigation service providers and airports – which will ultimately support larger volumes of vehicles. This coming together of technology with airspace modernisation and integration will enable the aviation industry to reach its next milestone."

Cohesion

Given all the modernisation projects across airspace, software, infrastructure and future flight, it is readily apparent that close co-ordination is essential between the various parties involved in the industry. To give an obvious example, introducing eVTOLs affects low-level air traffic management around airports.

Boulton noted: "Close collaboration across a broad range of stakeholders is essential to realise a modern, integrated airspace structure across the UK which works for all airspace users."

"We work closely with the Airspace Change Organising Group, aviation stakeholders including general aviation organisations, the Ministry of Defence,

airports, and adjacent national ANSPs to develop, plan and deploy change in accordance with the CAA's Airspace Change Process."

He added: "We also liaise internally within NATS' operation, across our many transformation and sustainment projects, to ensure the solutions and plans for deployment are coordinated. It is a challenge to coordinate, but airspace modernisation is something we and the industry want and need to deliver."

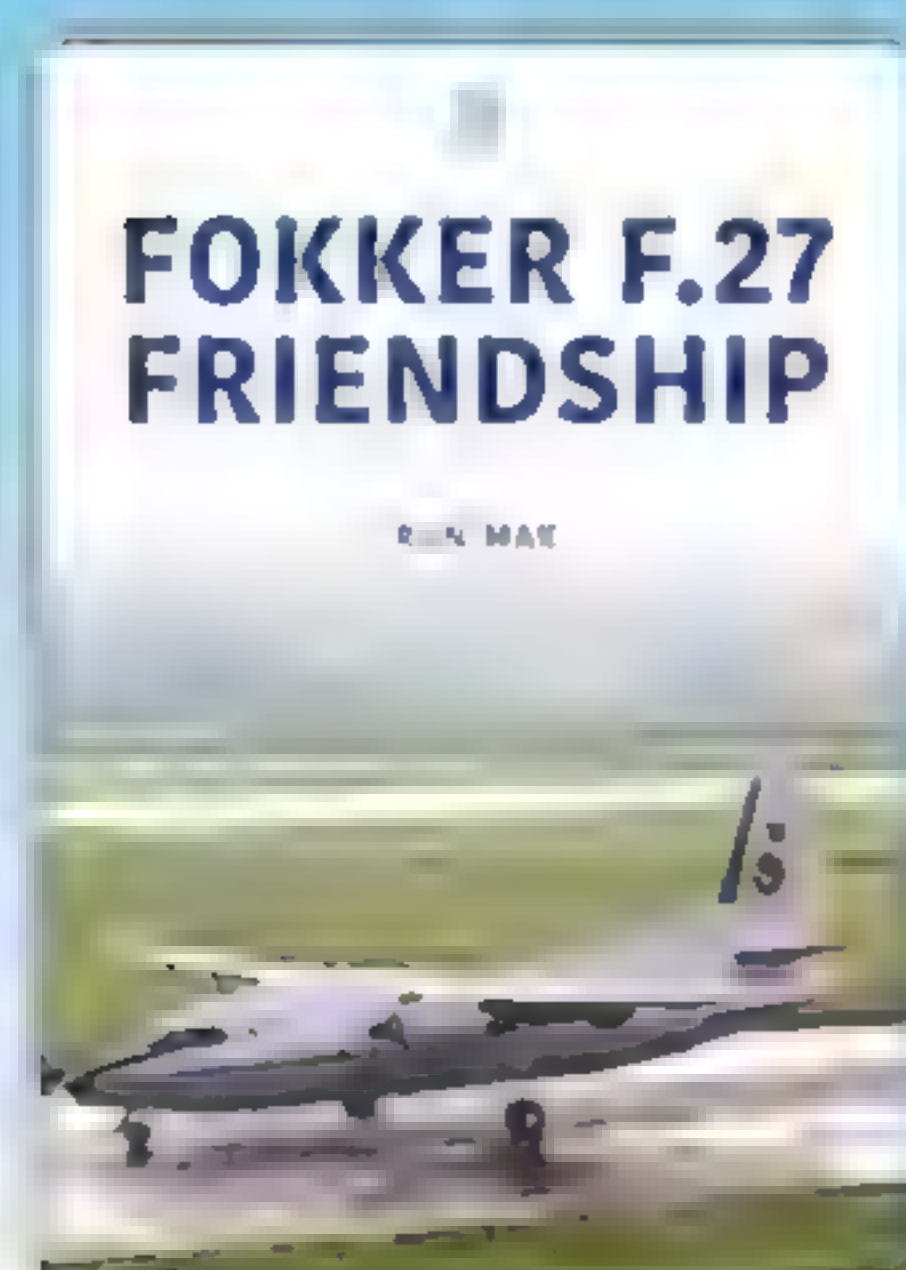
Overall, Boulton said: "As the aviation industry works to achieve 'net zero' by 2050, we know there's a lot of work to do. Cross-sector collaboration is integral, and there is a wide range of stakeholders that must work together to achieve this shared goal." **AI**



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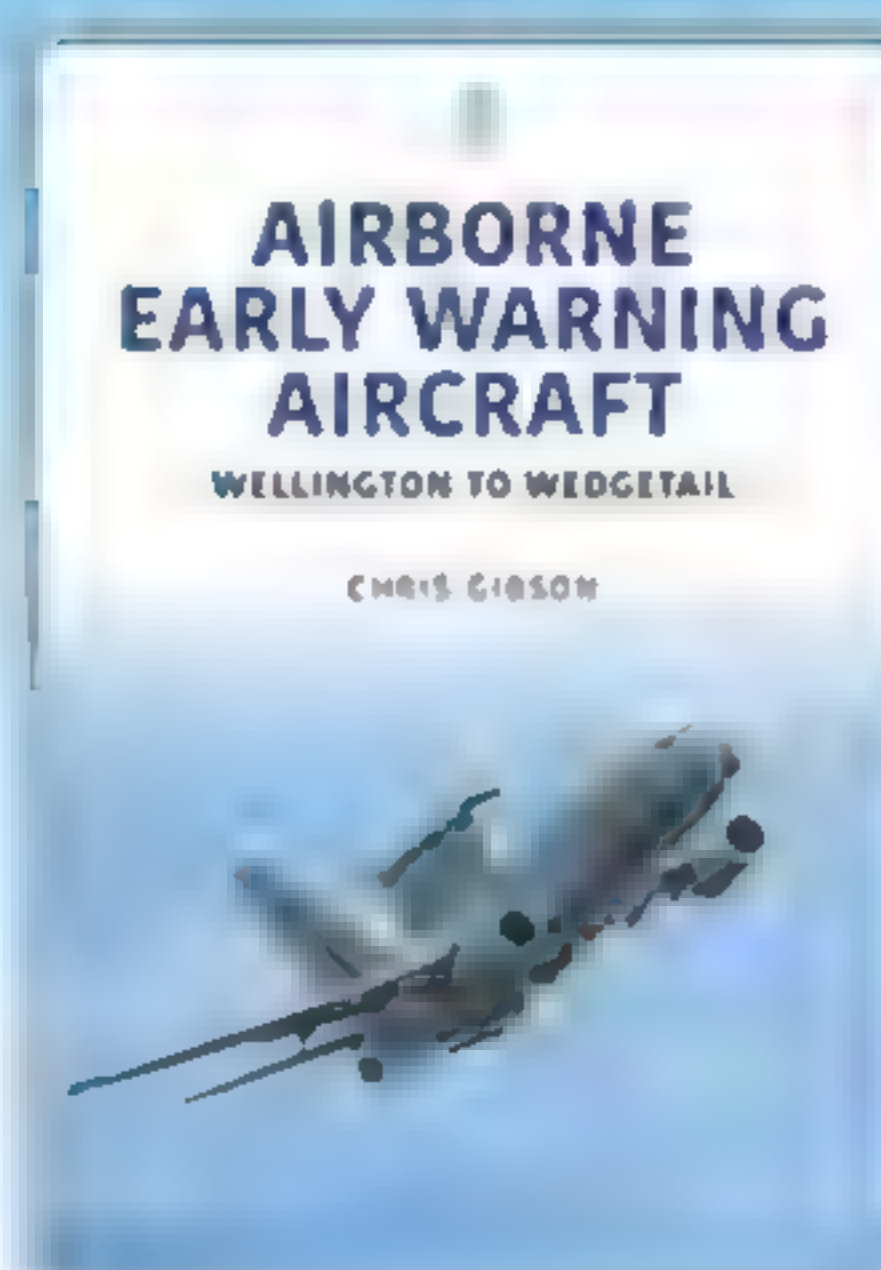
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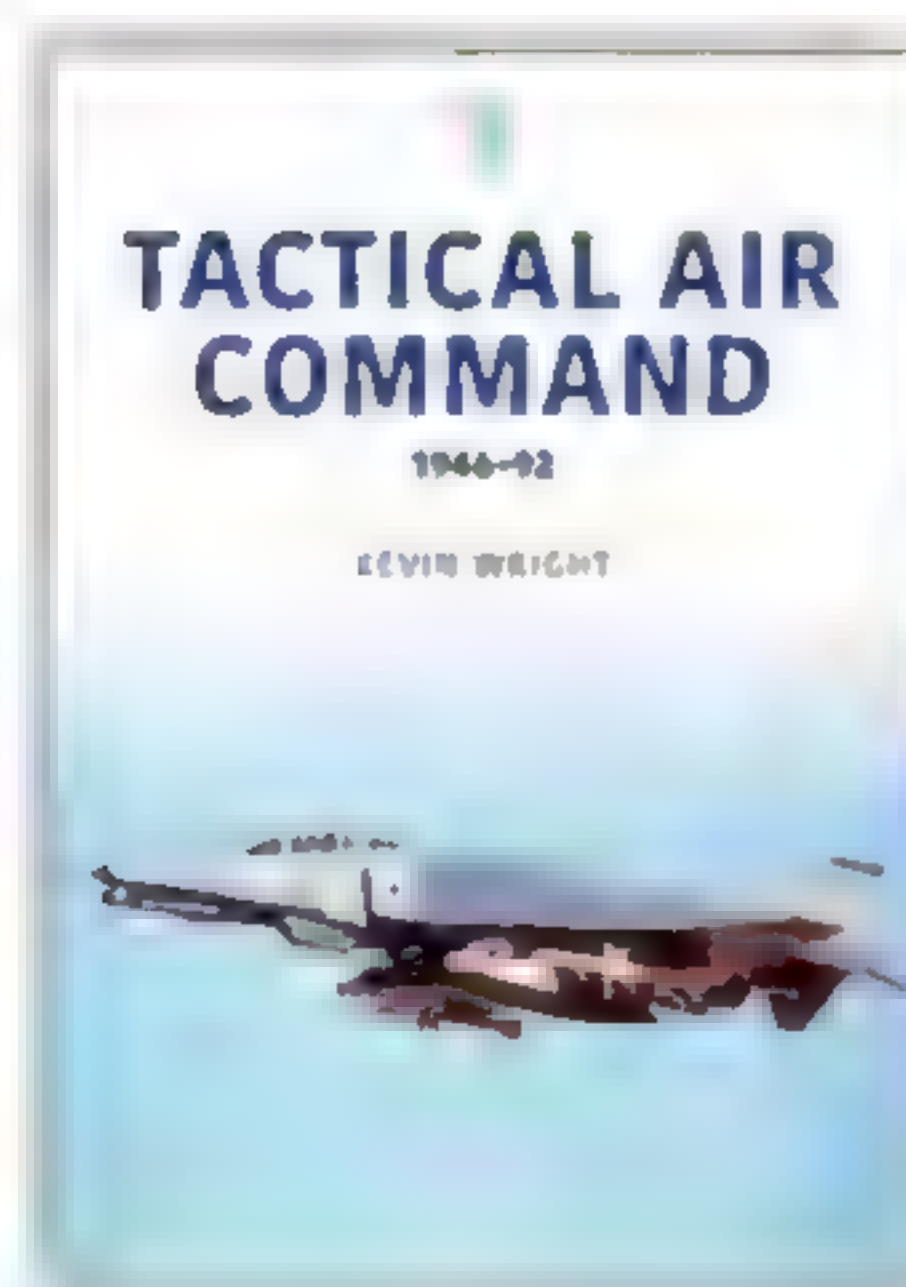
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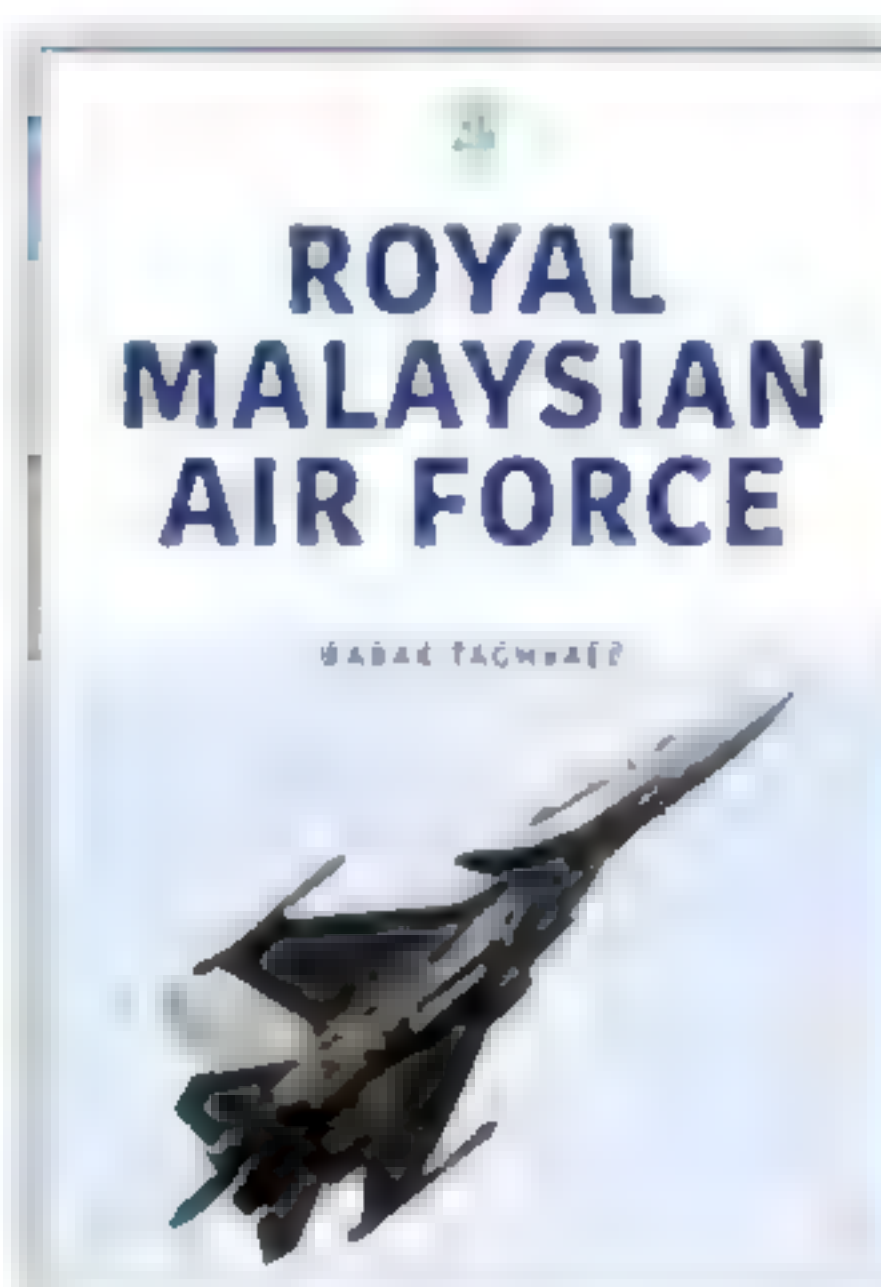
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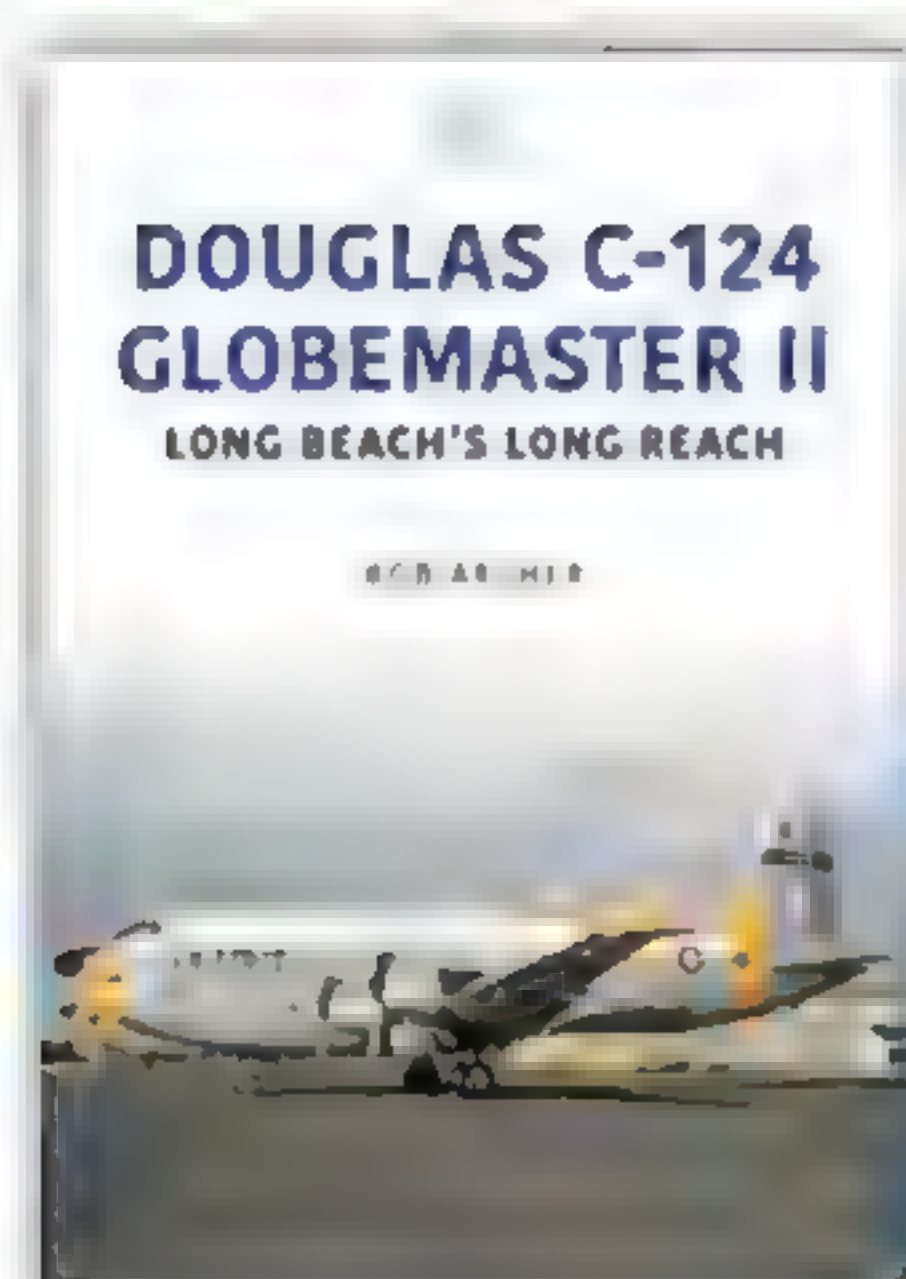
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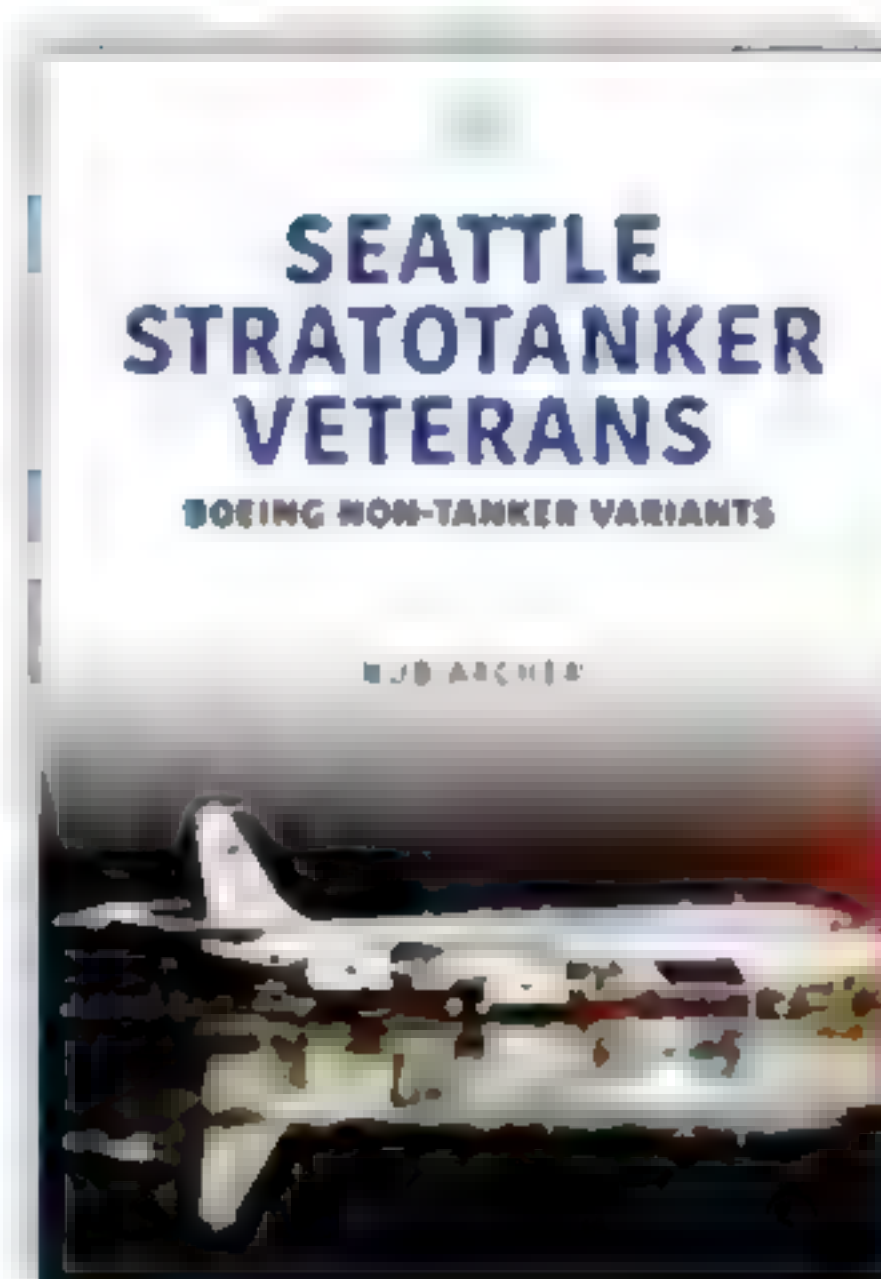
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Eight Questions

Yvonne Manzi Makolo was appointed CEO of RwandAir in April 2018. Since then, the airline has gone from strength to strength and has been praised for both its regional and international service. It's been a challenging time as Makolo revealed to *Air International*

Question 1: How does the African market differ from that in Europe? Are there any fundamental changes that impact daily operations?

I believe it's a very different operating environment. For aviation, the African market is highly underserved. The penetration is extremely low. Africa accounts for about 3% of innovation traffic, so, it's vastly, vastly underserved. This is a bad thing and a good thing because there is an opportunity to grow the market.

Another fundamental difference is the cost of operations – it's much more expensive within the Africa continent. Costs are much higher, whether we're talking about fuel or navigation, landing or parking. Everything is more expensive and access to aviation is much more costly.

We also have the issue of open skies, which is a challenge. Whereas in Europe, you have open skies, we're still operating on highly restrictive bilateral air service agreements, which become a challenge in terms of opening up new routes or adding additional frequencies for some routes.

Within the African continent, you need visas for many countries, as opposed to Europe, the Schengen area and all the other places where it's easy to move from one place to another. Here, in some cases, you have to apply for a visa two weeks in advance from one country to the next.

So those are some of the fundamental differences, as well as access to skilled labour, especially for pilots and engineers.

On the issue of visas, Rwanda stands out because the authority implemented the visa-on-arrival process for citizens of all countries in 2018, which is excellent for the country and the airline. It makes Rwanda a much easier place to transit through or visit. So it's great for us.

But the fundamental problem in Africa is that air travel is considered a luxury as opposed to a necessity, which allows some governments to tax all areas of aviation, making tickets very expensive and, to an extent, inaccessible for many people. So there's a fundamental change that needs to be made regarding the perception of aviation. It needs to be

regarded as an enabler that will allow citizens of the continent to move around freely, whether it's for business or leisure.

Question 2: In September 2022, it was speculated RwandAir may join OneWorld, making it the third carrier to enter an airline alliance in East Africa. Can you confirm this and what would be the benefits to the airline?

We never announced that we were joining OneWorld. We were in discussions with them. It would be a logical alliance to join, given that we're in the final stages of working with Qatar Airways. At the moment, we're focused on growing our network organically. ▶





“There’s a fundamental change that needs to be made regarding the perception of aviation”

and indirectly through our external coaches with Qatar and other airlines. But we want to join an alliance eventually and OneWorld would be the logical choice.

Question 3: *Compared to other international airlines, RwandAir is achieving a lot with a relatively small fleet of aircraft. Are there plans to increase the fleet, and if so, what types are you looking at and would the selection be geared towards new routes?*

We currently have a fleet of 14 aircraft, including one 737 freighter. We’re considering getting to about 25 aircraft in the next five years. We will be expanding our 737 fleet and also the A330. We’re looking at phasing out our regional aircraft – the CRJ and the Q400 – but we’re still looking at the options to replace them. That will contribute towards expanding our network of hubs and also adding additional capacity on existing routes.

Phasing out the CRJ is down to the need for more capacity. We started out

as a small airline, but even on the routes we’re currently operating, we’re reaching capacity. We have challenges regarding luggage allowance for the smaller aircraft, so we’d want to look at something bigger and rationalise our fleet, sticking with three types instead of having four. There are types out there with more efficient engines and new technology.

Question 4: *Currently, the airline has routes to only three European cities, Brussels, London and Paris. Will RwandAir seek to increase its presence across Europe and what do you see as potential challenges?*

We launched our Paris route a few months ago and we’ve just increased capacity in London, growing from three flights a week to six. And we’ll be going into daily flights. So, the European destination is an important one not only for Rwanda but for the rest of the African continent, but we’re looking at adding additional capacity instead of adding other routes.

From a tourism and business





perspective, London has served us very well, hence doubling the capacity. Brussels is still essential because Rwanda was formerly a Belgian colony and it's a vital link from a business perspective and the huge Rwandan diaspora in Brussels.

Question 5: Given the occasional unrest that impacts some African nations, how does RwandAir deal with this problem? What plans do you have to ensure safe travel is maintained across the continent?

Foreigners' safety is the number one priority, but we have to work within the context that we have. It is a challenge, especially regarding the closure of airspace. We recently went through a situation where a whole strip of the airspace was closed off – you had Sudan, Chad and Niger closed – so you had to fly an additional hour each way to Europe. We have to make sure that we always work safely, observing all the NOTAMs that are put in place and complying with them.

When we do have closures, it presents a huge challenge not only from a safety viewpoint but also financially because

you're flying for longer and burning more fuel. So that affects our crew utilisation. It messes up our schedule because you're adding two hours to your flight time. You may have an aircraft that's about to take off, so you either have to cancel the flight or delay the flight and work around that. Once a closure is lifted, then we're able to we're able to implement our regular route reasonably quickly.

The biggest challenge was definitely COVID-19. That was almost a complete shutdown of operations for several months. Keeping the airline alive through that and then coming back has been a very challenging situation.

Question 6: RwandAir was intended to be privatised after 2013, but these plans have been dropped and it will remain 99% owned by the government. In terms of support for the airline, what does this mean?

I wouldn't say privatisation is no longer the case, because we are currently in discussions with Qatar Airways, who are looking at taking a 49% stake in the airline, with the government retaining a

majority share. I don't have an exact timing, but discussions are at a very advanced stage. We're hoping to conclude soon, maybe next year.

Question 7: Passengers have praised RwandAir for its generous baggage allowance and the standard of its inflight services. Was this a long-planned strategic move when the European routes were relaunched? Has this increased international bookings?

We want to be a full-service airline. We want to operate as a world class airline and are competing with the best out there, so we are very much focused on delivering a good customer experience and quality service onboard and on the ground. We're glad that our passengers appreciate this.

We do implement a strict baggage policy, but we're able to give a generous baggage allowance on flights where we have the capacity.

We also have to be aware of what the competition is offering the African markets. A big segment of that is the trade market, supporting the economy between African countries, so they need generous baggage allowance. It makes us more competitive and provides better customer satisfaction.

Question 8: How do you spend your free time away from the airline? Any hobbies?

When I'm done with work the remaining energy I have is for my family. If I can squeeze in some reading, I do. I read a lot. I like yoga when I have time to enjoy it. But there's very limited time and there's only 24 hours in a day! **AI**

CLOCKWISE FROM TOP LEFT:
With its current fleet standing at 13 passenger aircraft and one freighter, by 2025, RwandAir intends to have doubled its fleet to around 25 aircraft in the next five years

All images via RwandAir

At the moment, Makolo is focusing on increasing RwandAir's capacity on popular routes already established by the airline

The airline is keen to increase its own skill set in terms of ground crew and maintenance personnel without having to rely on other countries for skilled labour

The Bombardier Q400s will be retired from RwandAir's fleet in the next few years, with the airline looking at replacement types which will be suitable for increasing its domestic routes

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The medium helicopter sector

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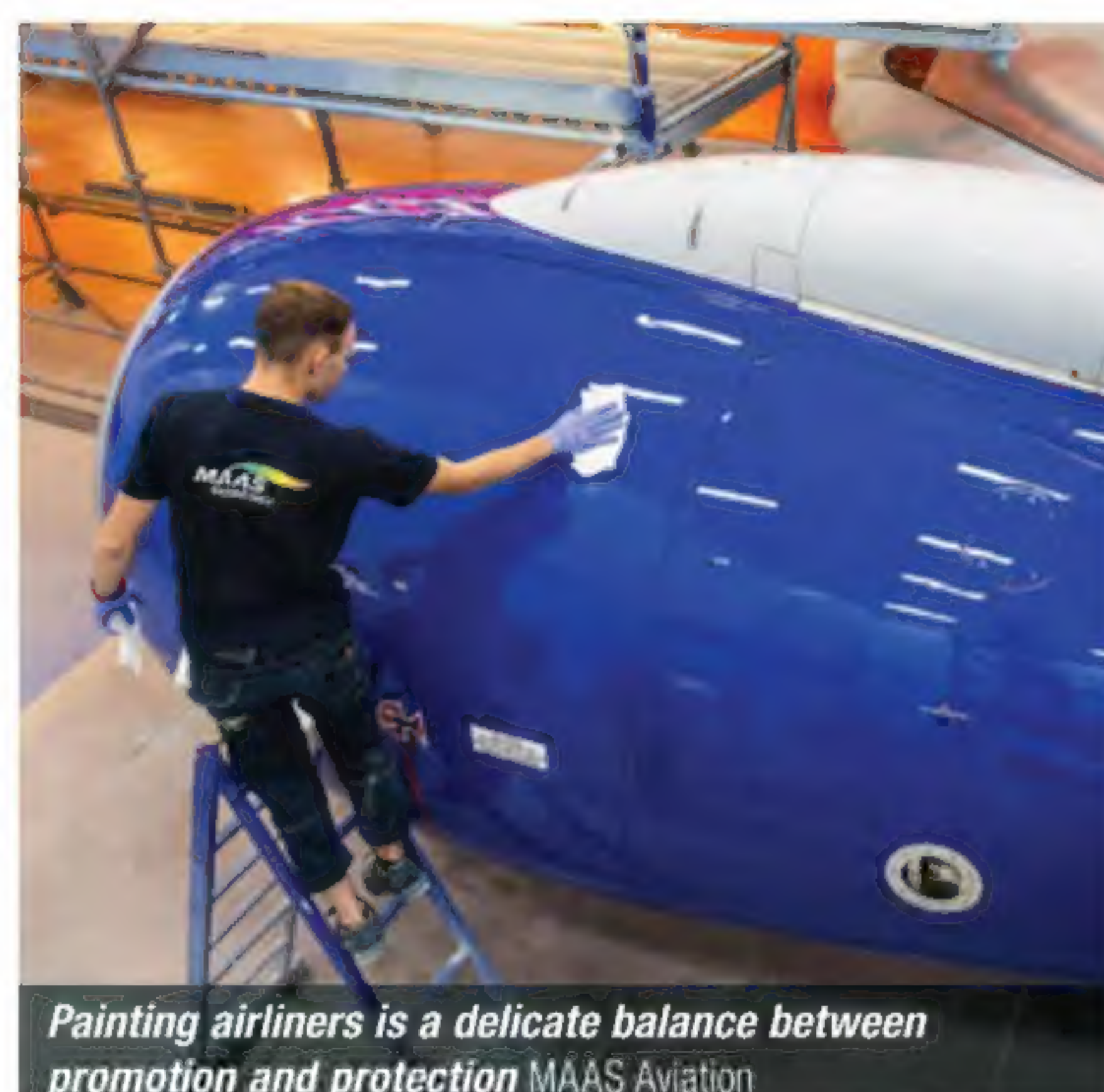
Dornier 328 What is the latest from Deutsche Aircraft as the company works on the next-generation D328eco?

Eight Questions – MAAS Aviation

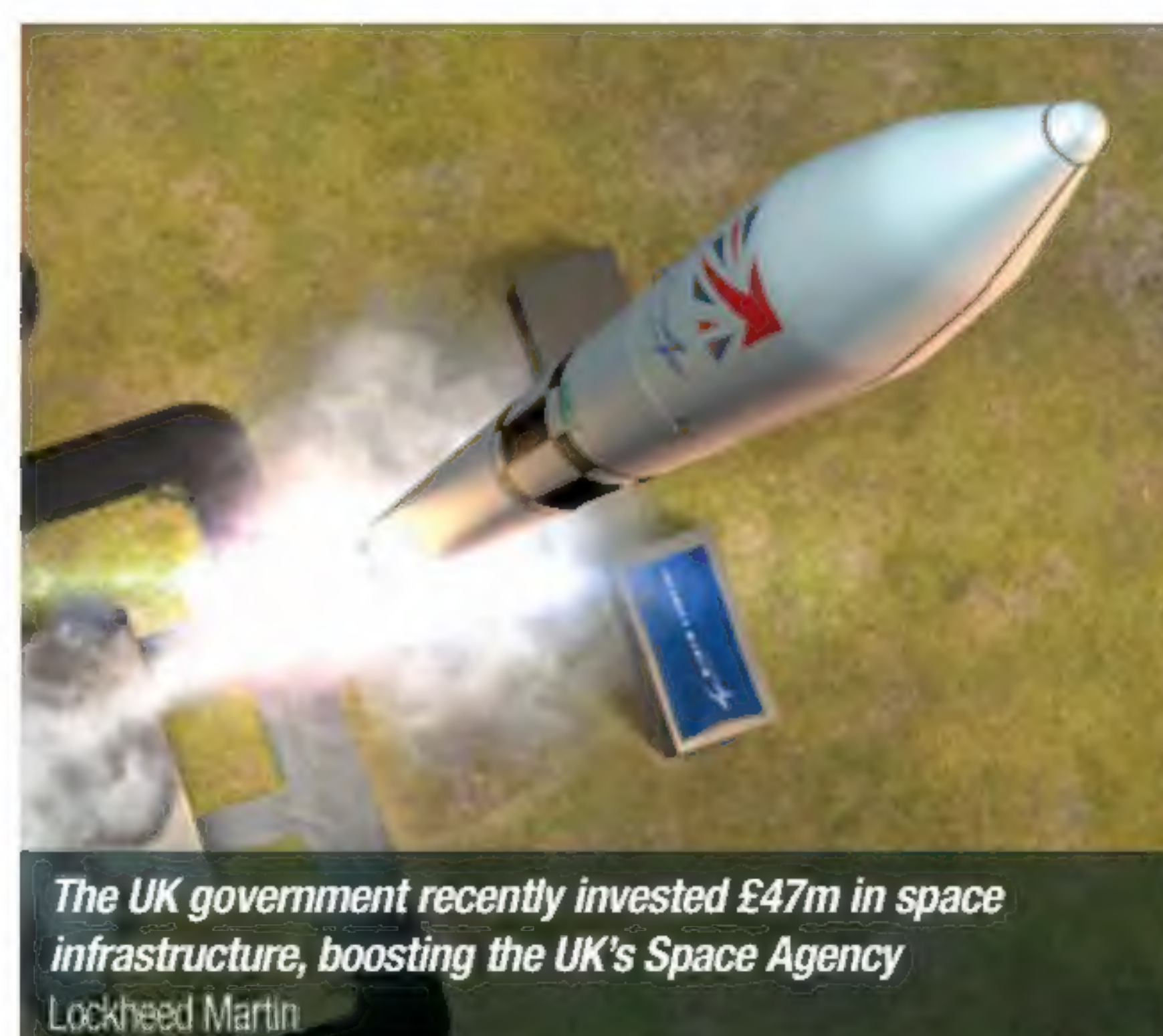
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UK space What is happening in the UK space sector, from small satellites to spaceports, finance to missions?

Asian aviation With Chinese airlines moving to total capacity, nations around Asia are gearing up for a hectic start to 2024



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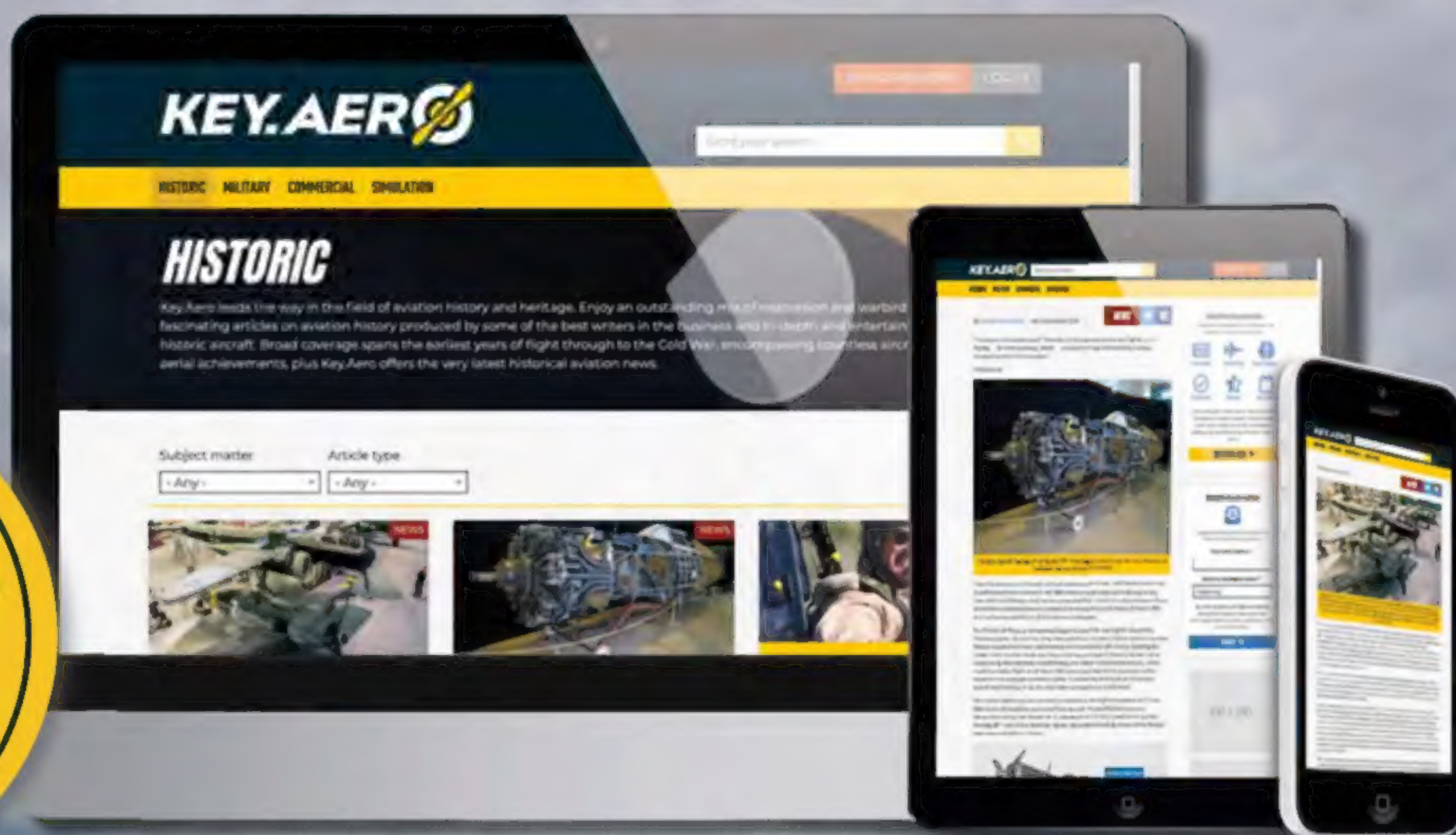
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